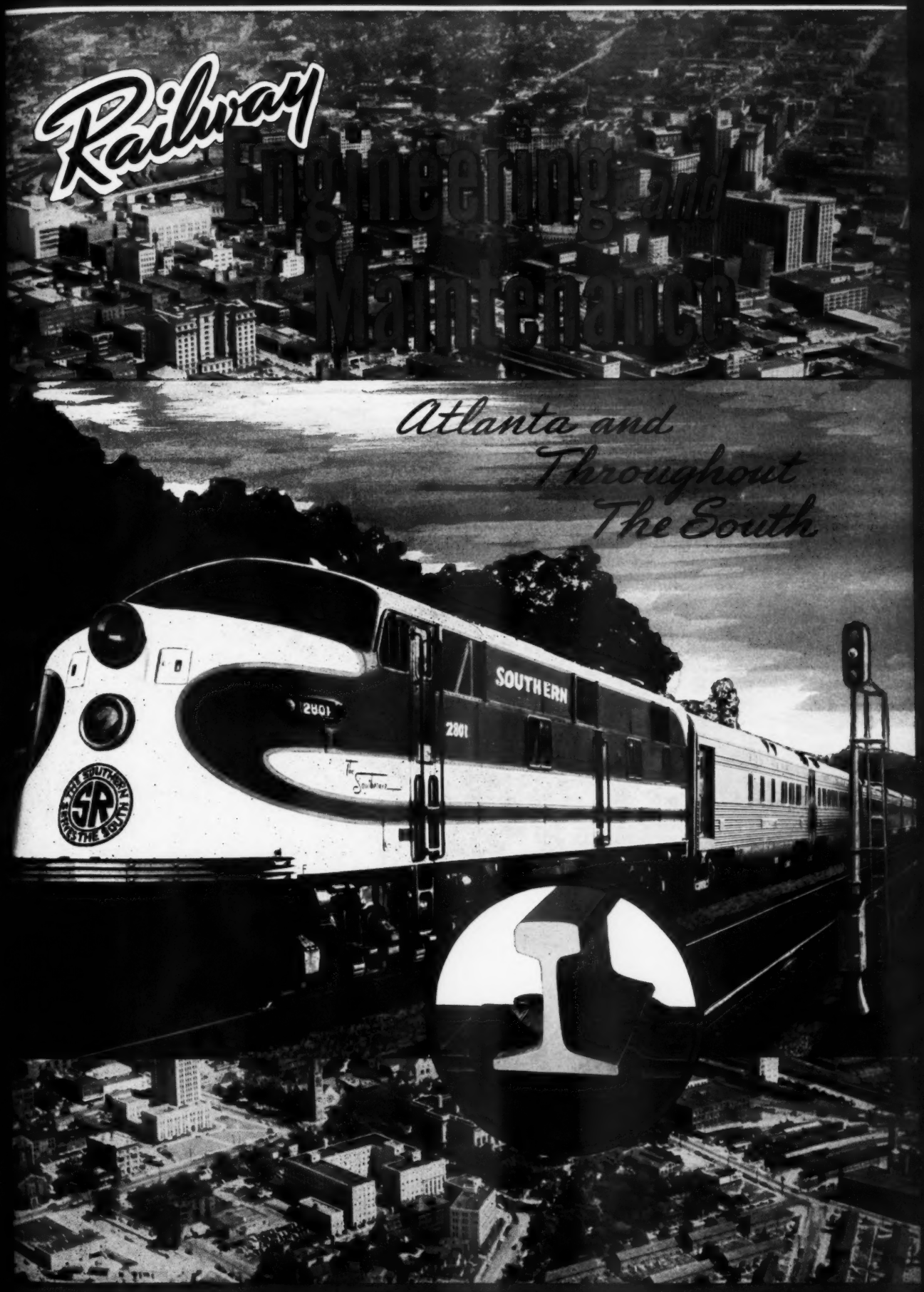
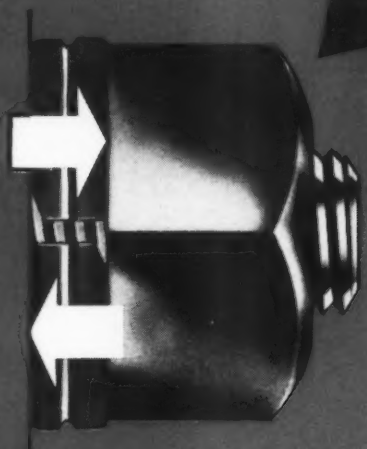

Railway Engineering and Maintenance
Atlanta and Throughout The South
SOUTHERN
2801
SR
THE SOUTHERN RAILWAY SYSTEM

why Reliance Xtra-hy hy-crome spring washers keep track bolts tighter longer



12,000 to
14,000 lbs.
compressed

5,000 to
5,800 lbs.
back turn

A. R. E. A.
1948 SPECIFICATIONS
1-inch Bolt

- Fully compressed, Reliance Xtra-Hy Hy-Crome Spring Washers exert a mechanical reactive pressure of 12,000/14,000 pounds between the nut of a track joint bolt and the joint bar. At a quarter turn from the fully compressed position, the reactive pressure is 5,000/5,800 pounds.

- This protective reactive pressure functions continually night and day, summer and winter, free or under traffic.

- Use Reliance Xtra-Hy Hy-Crome Spring Washers in your heaviest traffic areas and see how they reduce maintenance costs.

- A Reliance railroad sales engineer will be glad to supply details without obligation. Track and motive spring washer folder furnished upon request.

EATON

N MANUFACTURING COMPANY

EATON RELIANCE DIVISION, MASSILLON, OHIO

LONG SWITCH POINTS

Bethlehem can make and heat-treat them in lengths to 45 feet

When your track design calls for long switch points, and you have specified heat-treatment, Bethlehem is your surest source of a first-class job. We have for years maintained special equipment for the treating of extra-long points, and we are able to handle such jobs with complete ease.

Naturally, our shops also have full facilities for the making and treating of smaller units in all standard sizes. Give us your specifications; you can depend upon us to meet them in every detail.

At Bethlehem precise heat-treating techniques have been developed by metallurgists specializing in this field. The methods and equipment used were evolved only after the closest studies of rail-steel chemistry and the requirements of modern, high-speed track.

Call Bethlehem when in need of heat-treated switch points and other track components . . . including such accessories as rail braces, switch stands, frog plates, guard rails, etc.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

Published monthly by Simmons-Boardman Publishing Corporation, 79 W. Monroe St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00 for one year; $3.00 for two years. Single copies 50 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Marion, Ind., post office. Address communications to 79 W. Monroe St., Chicago 3, Ill. Volume 46, No. 7.

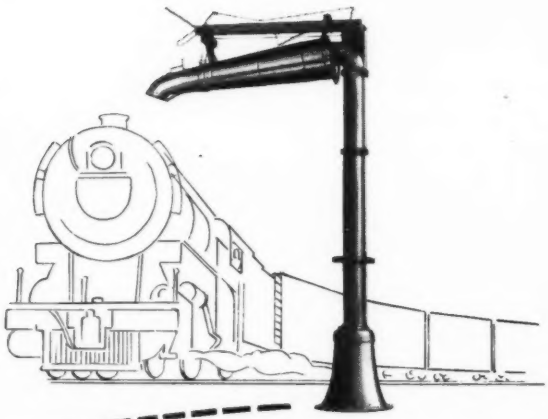
Prevent Costly Hammer or Shock!

by using GA GOLDEN-ANDERSON

STANDPIPE WATER COLUMNS

WITH

"Cushioned" VALVES



Golden-Anderson counter-balanced Railroad Standpipe Columns and Cushioned Valves have been used for over fifty years by America's leading railroads for absolute dependability, longer service and less maintenance.

The water column rotates in a 360° circle permitting use between tracks. The free joint on the spout and the automatic drain valve make this water column freeze-proof.

The valve is easily adjusted for any required speed of operation on high or low pressures. The air and water cushioning enables the valve to function smoothly without hammer or shock.

Write for Engineering Bulletin

GOLDEN-ANDERSON
Valve **SPECIALTY COMPANY**
2078 KEENAN BUILDING · PITTSBURGH 22, PA.

LIFE AND PROPERTY PROTECTION
VALVES
FOR OVER 50 YEARS

THINK—

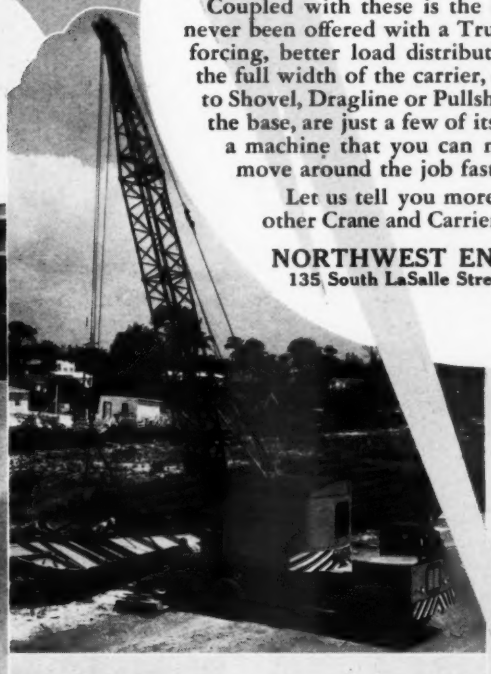
what this machine can do for You!

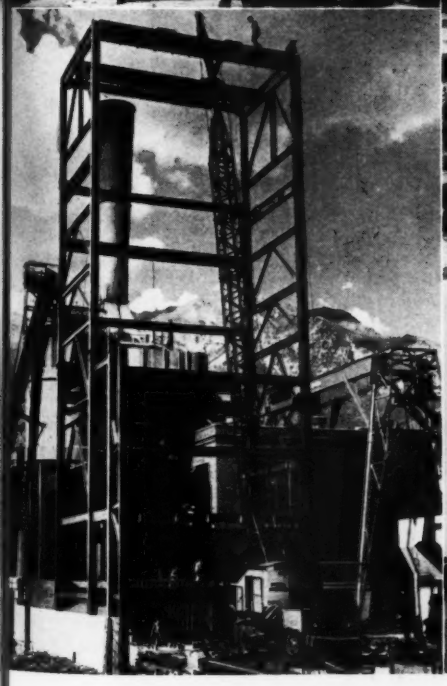
Here's a unit that can get around! It handles booms from 30 to 100 feet and a jib. The Northwest High-Speed, Power-Controlled Boom Hoist is independent of all other operations. The "Feather-Touch" Clutch Control, Uniform Pressure Swing Clutches, the Cushion Clutch and other Northwest advantages are standard equipment.

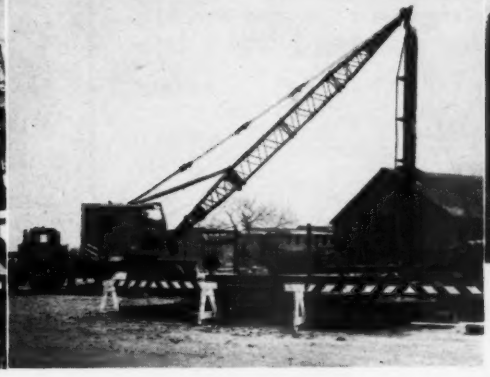
Coupled with these is the Carrier, the like of which has never been offered with a Truck Crane. Better frame reenforcing, better load distribution, outriggers that extend the full width of the carrier, easy conversion from Crane to Shovel, Dragline or Pullshovel without repositioning the base, are just a few of its many advantages. Here's a machine that you can move on the job fast and move around the job fast.

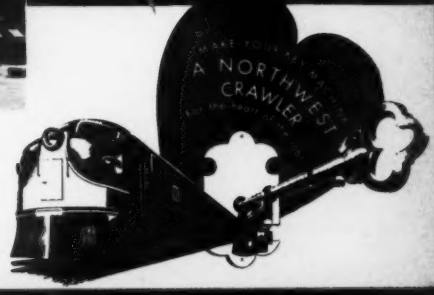
Let us tell you more about it. There is no other Crane and Carrier combination like this.

NORTHWEST ENGINEERING CO.
135 South LaSalle Street, Chicago 3, Illinois



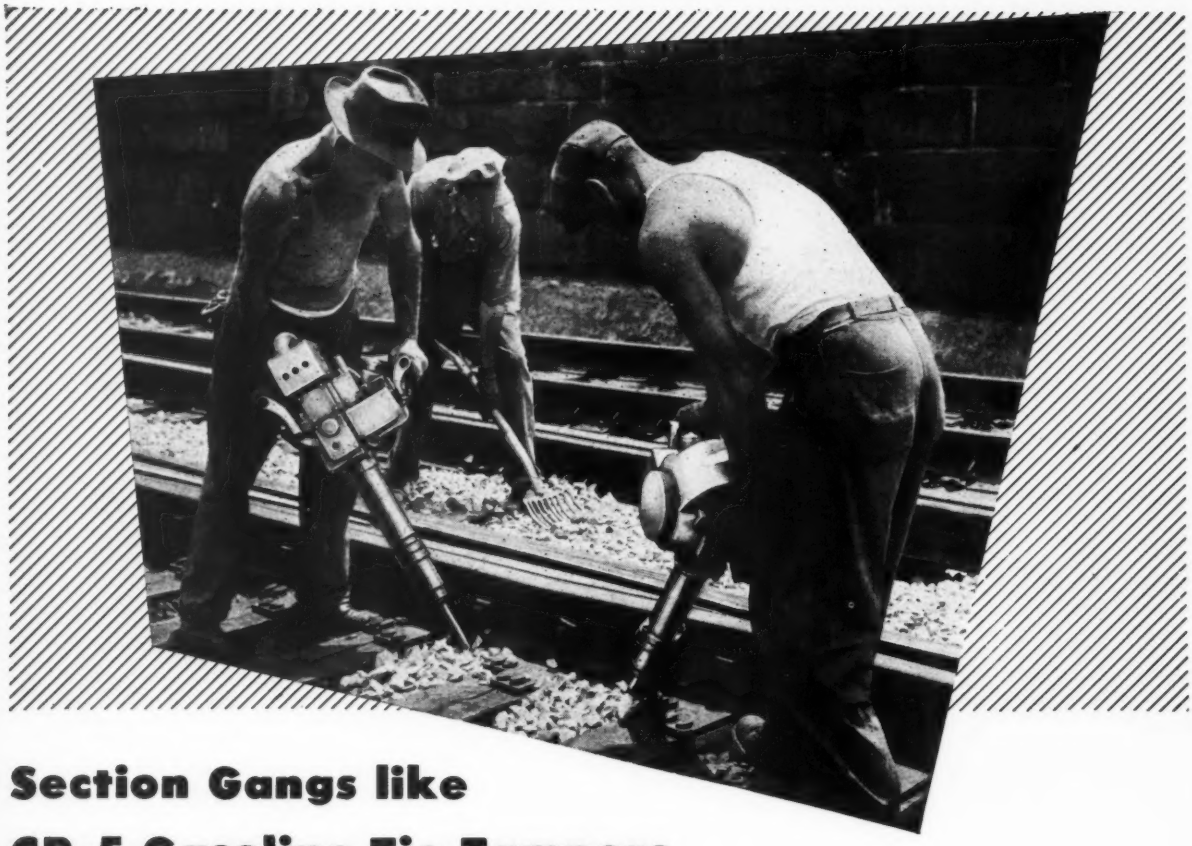






NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE



Section Gangs like CP-5 Gasoline Tie Tampers

because —

Starting is quick and easy — by pressure on one of the grip handles.

Balance is perfect — weight is centered between grip handles.

View of work is unobstructed, because of compact engine design and slender contour of lower end of tool.

Vibration is minimized in grip handles by air-cushioning of return stroke of free-throw striking piston — machine life is prolonged.

Magneto provides efficient ignition system under all conditions — there are no batteries, thus eliminating costly battery replacements.

Standard two-cycle engine operates on gasoline-oil fuel mixture — oil in fuel provides automatic lubrication.

Write for Bulletin 1943
Maintenance-of-Way Equipment

OTHER CP MAINTENANCE-OF-WAY AND TRACK EQUIPMENT

Air Compressors — Patrol, Crawler, Flanged Wheel Mounted . . . Pneumatic Tie Tampers . . . Reversible Pneumatic Impact Wrenches . . . Wire Brush Machines . . . Boyer Rivet Busters . . . Scalers . . . Spike Drivers . . . Nut Runners . . . Concrete Vibrators . . . Winches . . . Rotary Drills . . . Wood Borers . . . Portable Electric Saws.

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

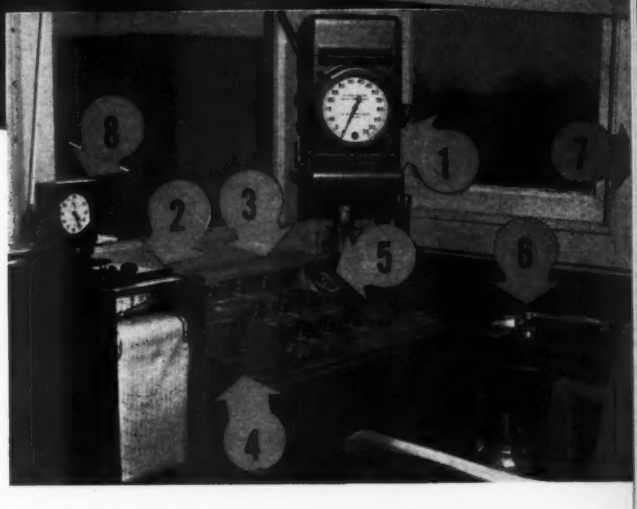
POSITIVE DOSAGE CONTROL and WEED KILLING ACTION

THE *Nalco* SYSTEM of WEED CONTROL

SPRAYING Nalco's H-170 "top-and-root" weed control with one of Nalco's new *labor-saving* Weed Control Cars provides positive dosage regulation, as well as complete records for future reference! H-170 is sprayed directly from tank car without mixing or dilution. It assures a complete top kill of all succulent vegetation, and extensive root kill to retard re-growth. Rainfall after application will not reduce H-170 effectiveness . . . Safe to use where livestock may be grazing . . . Will not disrupt track signal systems, or contaminate water supplies.

Write for detailed information on H-170 and the complete Nalco System of Weed Control.

NATIONAL ALUMINATE CORPORATION
6196 W. 66th Place • Chicago 38, Illinois
Canadian inquiries should be addressed to Alchem Limited, Burlington, Ontario



Top illustration shows Nalco Weed Control Car, with three-bank, 22-feet-wide sprays, and an additional 13-foot side spray boom for sidings. Lower photo shows operating controls of Spray Car. 1 Recording speedometer, 2 Recording H-170 flow meter, 3 Nozzle bank control valves for pinpoint spraying accuracy, 4 Left-side spray boom control, 5 Spray manifold pressure gauge, 6 Nalco Meter-Chem main control valve 7 Indoor-outdoor thermometers, 8 Timing clock. Not shown are intercommunicating telephone equipment for direct contact between Nalco Spray Car and work train locomotive, and direct-connected 50-foot auxiliary hose reel and spray nozzles for off-track spraying.

THE *Nalco* SYSTEM • Serving Railroads through Practical Applied Science

It TAMPS!
...as it SAVES!
...as it PAYS FOR ITSELF

No question about it! Actual experiences of railroads that have used Pullman-Standard Power Track Ballasters for several years have *proved* these facts for *you:* (1) This Ballaster not only tamps, it does a *far better job* of tamping. It proves . . . *again* . . . the superiority of machine-production methods over less-efficient hand labor! (2) This machine actually saves enough in direct labor costs to *pay for itself* in one season's average operation.

The Power Ballaster is a boon to the maintenance man who is struggling to control costs under the 40-hour week. Companion equipment . . . the Power Cribber and the Ballast Cleaner . . . provides similar savings.

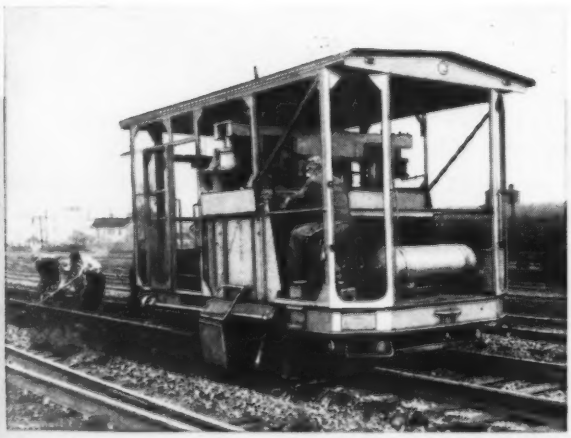
It's easy to acquire this money-saving equipment, with your choice of three methods: (1) Outright purchase, of course; (2) Easily handled installment terms; (3) A pay-as-you-save rental plan, with option to buy.

One way or another, you can set up cost records to show the savings, as you invest in a modern track-conditioning system for your railroad. Get the full story today.

Pullman-Standard
CAR MANUFACTURING COMPANY

POWER BALLASTER DIVISION
79 East Adams Street, Chicago 3, Illinois

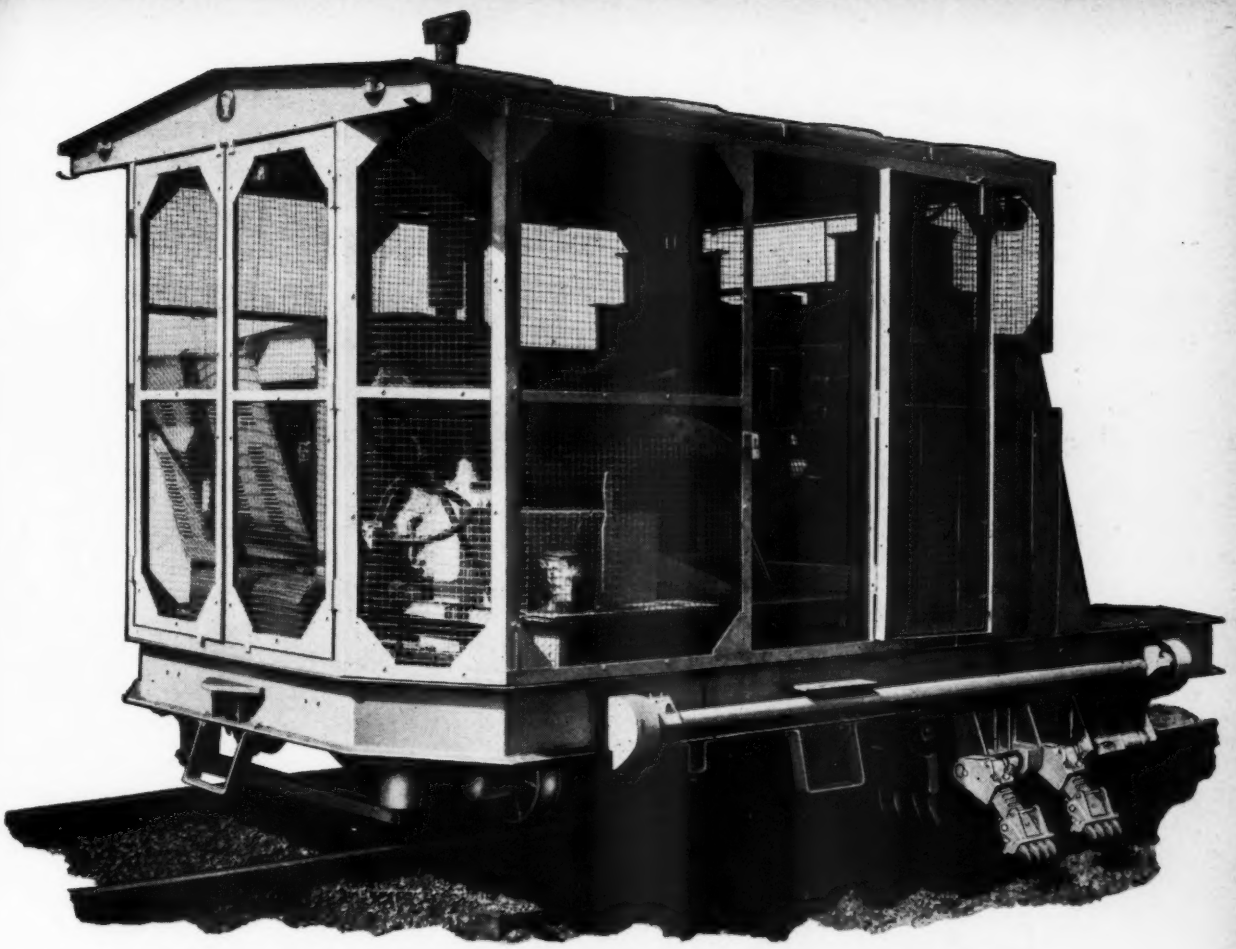
BIRMINGHAM 3, 1004 First National Building • CLEVELAND 15, 907 Midland Building • PITTSBURGH 19, 1115 Gulf Building
NEW YORK 17, 52 Vanderbilt Avenue • WASHINGTON 6, D. C., 1025 Connecticut Avenue, N. W.
SAN FRANCISCO SALES REPRESENTATIVE: MARK NOBLE



COMPANION TRACK-MAINTENANCE EQUIPMENT

POWER TRACK CRIBBER . . . Often called a "mechanized pick-and-shovel gang," the Cribber has impact bars to loosen the ballast, followed by digger bars which clear out the crib. Depending upon traffic and ballast conditions, there have been known savings of $900 to $1,500 per mile over hand cribbing.

BALLAST CLEANER . . . Latest addition to the Pullman-Standard track-conditioning team, the Ballast Cleaner in actual service has clearly indicated savings as high as those recorded with the Cribber and Ballaster. It cleans both cribbed-out and shoulder ballast (both shoulders at once) without fouling adjacent track.



PULLMAN-STANDARD POWER BALLASTER

Underneath this machine are eight tamping bars which lift and drop 30 times a minute, on the pile-driver principle. Toward the end of each stroke, a cam-and-roller action forces the ballast under the tie, about two inches below the bottom of the tie. The action is mechanical . . . the result is uniform!

Case History Notes

• One railroad experienced an unprecedented low cost of $422.40 per mile with the Power Ballaster . . . against a previous cost of $1,470.00 per mile with the usual pneumatic hand tools. A saving of $1,047.60 per mile!

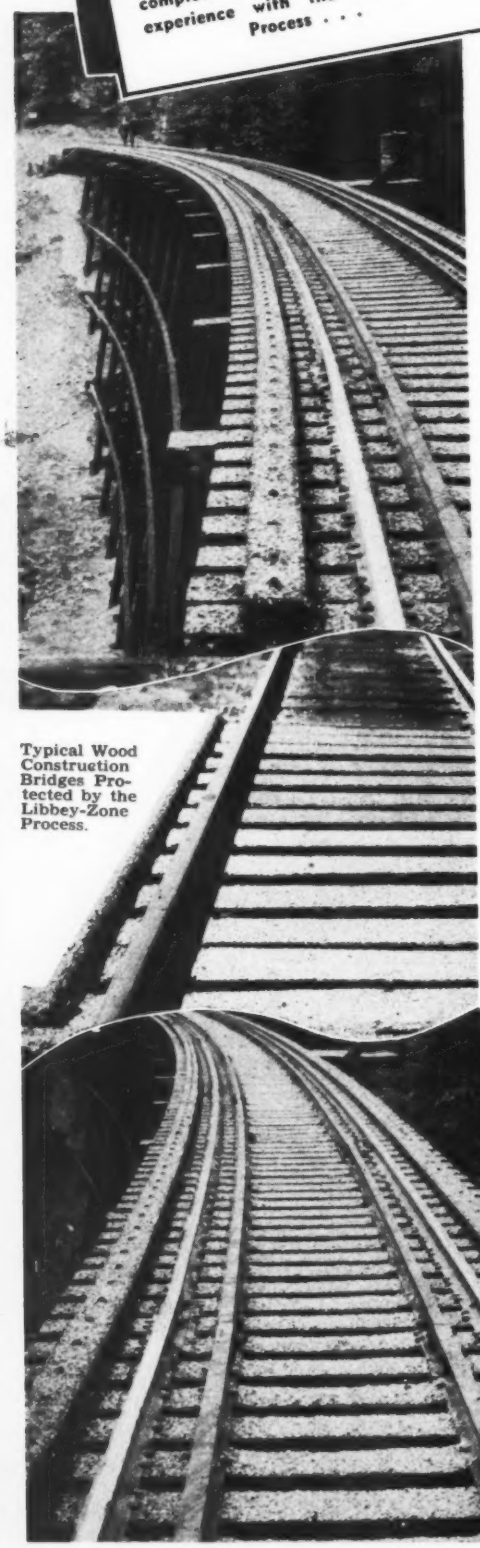
• An eastern road's first test of a Pullman-Standard Power Ballaster showed a saving of $963.78 per mile! More machines were added and, although conditions varied greatly, the savings of a number of machines averaged $600 per mile of track.

• Another road demonstrated a four-machine, production-line operation. Two Cribbers were followed closely by a Cleaner and a Ballaster. With only a 24-man gang to attend them, these machines cribbed out the track, cleaned the ballast, and tamped the ties at the rate of 450 to 600 feet per hour!

• One road, trying its first Power Ballaster, tamped 76 miles of track, averaged 3,200 track feet per day, at a cost of only $380 per mile. Formerly, on this same road, a 28-man gang with 12 pneumatic tamping tools covered only 1,000 track feet per day, at a cost of $1,214.00 per mile. *Saving: $834.00 per mile!*

• If you don't have your copy of "Track at its Level Best . . . for Less Money," you are invited to write for one today. This brochure is profusely illustrated with photos and drawings, and it clearly explains the operation of Pullman-Standard's Cribber, Cleaner, and Ballaster.

Be sure to read the article on Page 640 of this issue . . . for complete resume of one railroad's experience with the Libbey-Zone Process . . .



Typical Wood Construction Bridges Protected by the Libbey-Zone Process.

Cut Bridge Fire Expense...

INVESTIGATE THE

LIBBEY-ZONE PROCESS

Leading Roads Achieving Remarkable Success in Restricting Bridge and Trestle Fire Damage . . .

EASY TO APPLY — LASTS FOR YEARS

The photographs at the left were selected at random from our files. Many leading railroads (names furnished gladly upon request) are now restricting fires on wooden structures with the effective Libbey-Zone Process. One large system, whose experience is covered in the article on page 640 of this issue, has now treated over a thousand structures with highly gratifying results.

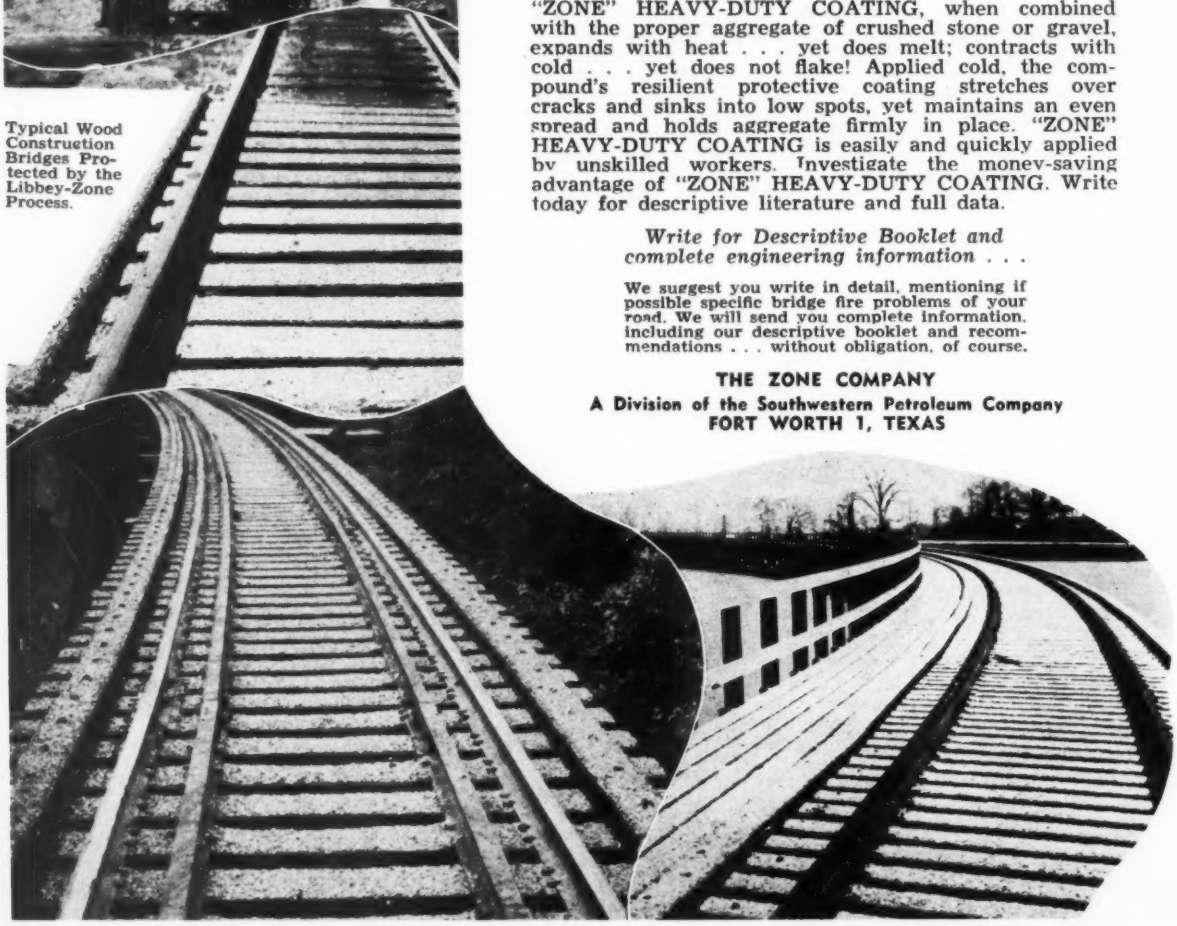
Every open deck timber bridge presents its own fire hazard. Brake slivers, fuzees, cigarettes, flaming fuel drippings from locomotives . . . all find a ready fire target on exposed, untreated wood surfaces.

"ZONE" HEAVY-DUTY COATING, when combined with the proper aggregate of crushed stone or gravel, expands with heat . . . yet does melt; contracts with cold . . . yet does not flake! Applied cold, the compound's resilient protective coating stretches over cracks and sinks into low spots, yet maintains an even spread and holds aggregate firmly in place. "ZONE" HEAVY-DUTY COATING is easily and quickly applied by unskilled workers. Investigate the money-saving advantage of "ZONE" HEAVY-DUTY COATING. Write today for descriptive literature and full data.

Write for Descriptive Booklet and complete engineering information . . .

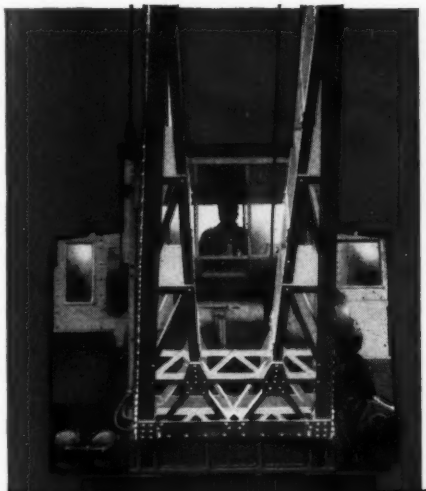
We suggest you write in detail, mentioning if possible specific bridge fire problems of your road. We will send you complete information, including our descriptive booklet and recommendations . . . without obligation, of course.

THE ZONE COMPANY
A Division of the Southwestern Petroleum Company
FORT WORTH 1, TEXAS

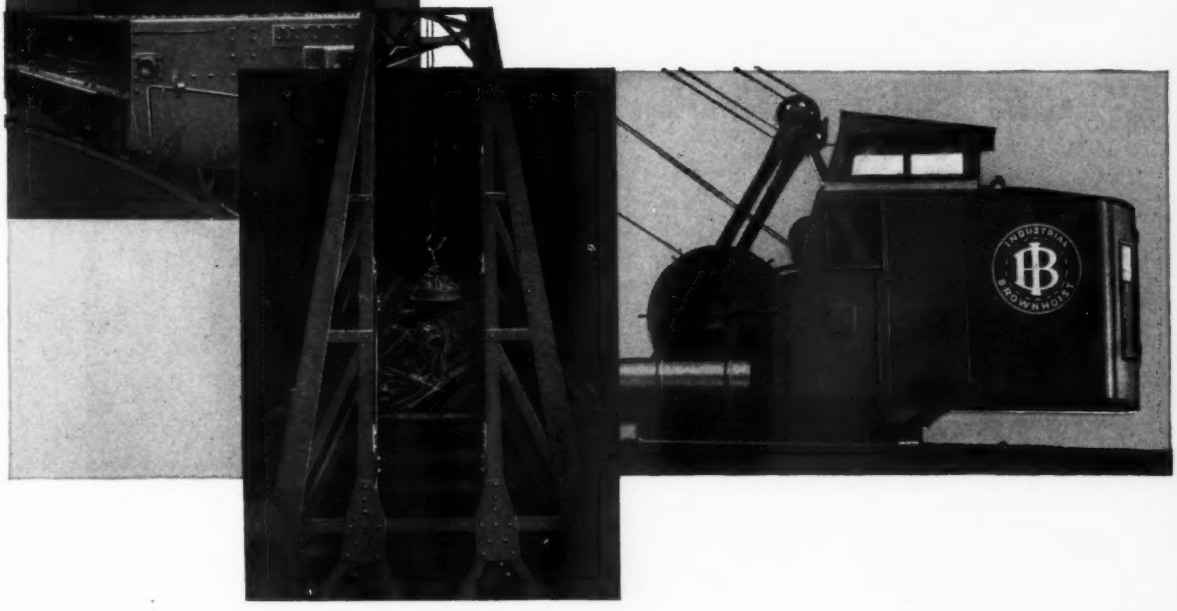


NO BLIND SPOTS IN THIS CAB!

EXCLUSIVE BROWNHOIST "MONITOR-TYPE" CAB GIVES CRANE OPERATORS CLEAR FULL-CIRCLE VISIBILITY . . .



The patented Monitor-type cab, available only on Industrial Brownhoist Locomotive Cranes, is the one and only crane cab that provides a clear view from every angle — it's the one cab that allows full 360° visibility at all times — to the *front, sides* and *rear.* That's because the Monitor-type cab is fully enclosed with large windows and is placed *high on top of the crane.* The operator is *above* all machinery or braces that might obstruct his vision. He can speedily, accurately, and efficiently load or unload from high-walled railroad cars because he can look *right into* the car. Hoist and boom drums are in full view. To further insure good visibility, all Brownhoist cranes are equipped with the clear-vision boom that permits the operator to look right through it with unobstructed visibility.

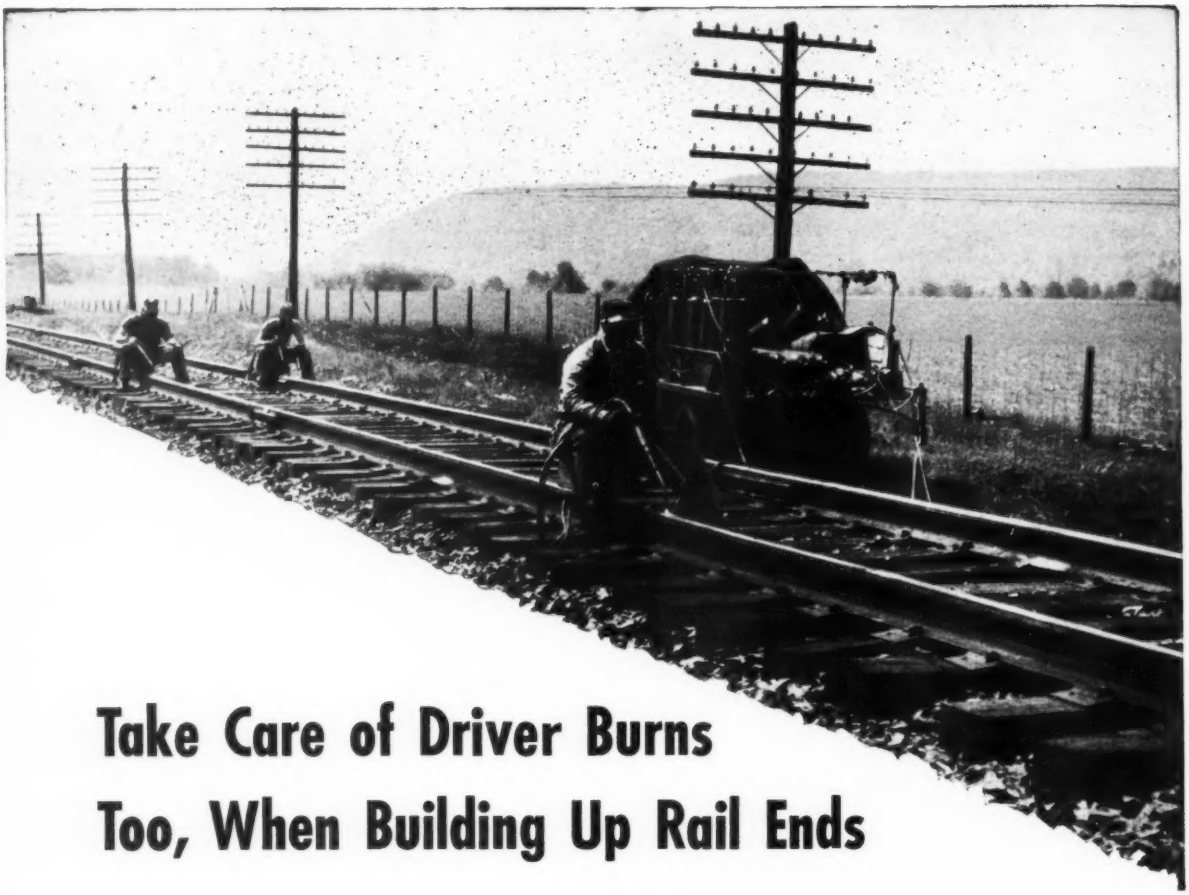


In addition to full-circle visibility, the Monitor-type cab is designed to afford the utmost in comfort and safety including doors on both sides and 14" safety clearance between car and rotating upperworks. There is a soundproof partition between the operator and machinery — provision for opening all windows and doors for full ventilation — all operating controls are easily reached from a comfortable, well raised seat. Write today for more facts complete with specifications.

140

BROWNHOIST BUILDS BETTER CRANES

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN • **DISTRICT OFFICES:** New York, Philadelphia, Cleveland, San Francisco, Canadian Brownhoist Ltd., Montreal, Quebec. **AGENCIES:** Detroit, Birmingham, Houston, Los Angeles, Portland, Seattle, Spokane.

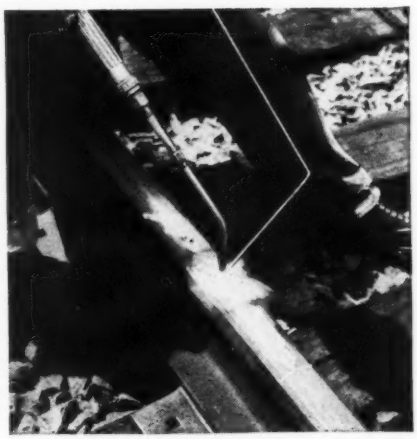


Take Care of Driver Burns Too, When Building Up Rail Ends

When your rail-end welding gangs are out on the job, driver burns can be repaired at the same time. Manpower, tools, and supplies are all on hand to do both jobs.

The pictures show how driver burns are removed by a large Eastern railroad. The gang shown is one of several out on the line using OXWELD MW rod to build up rail ends and eliminate driver burns. Frequent checks with the rail detector car in the last five years have shown that the original soundness of the rail has been restored.

For details on how this procedure can be adapted to your track programs write for Form 7448.



Here's how easily driver burns are built up with OXWELD MW rod.

The term "Oxweld" is a registered trade-mark.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building Chicago and New York
In Canada:
Canadian Railroad Service Company, Limited, Toronto

OXWELD RAILROAD SERVICE

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

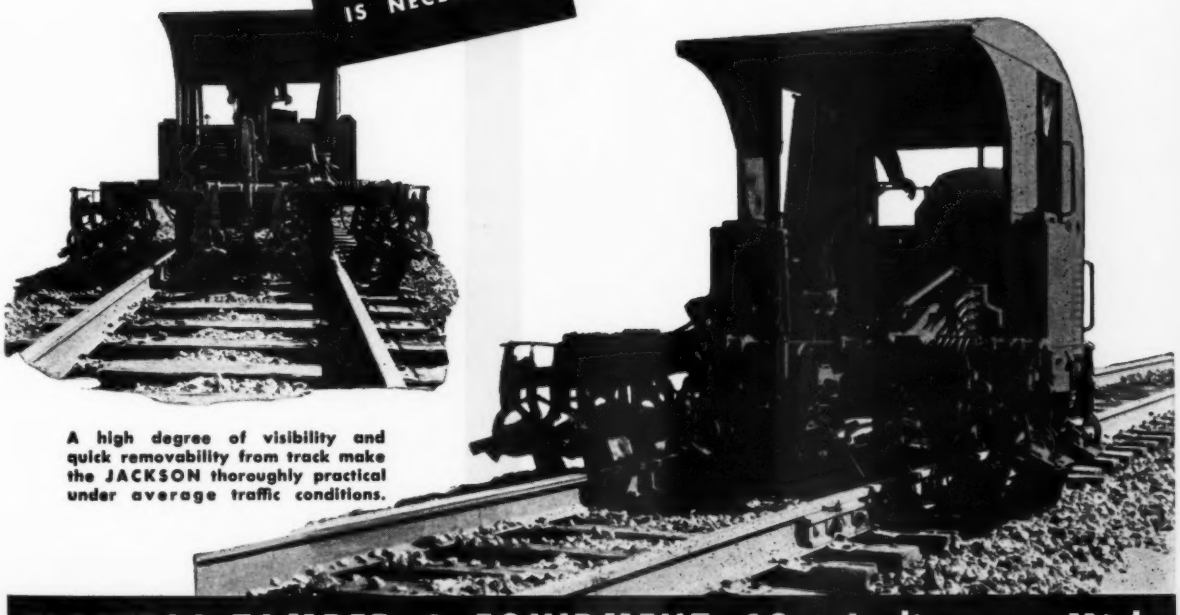
WESTERN PACIFIC R. R. CO.

35th in the SWING to JACKSON MULTIPLE TAMPERS

Upper half of cab may be quickly removed for handling with crane, replaced for weather protection.

In your search for the best means of obtaining better track in the fastest possible time, with the minimum of labor and at the lowest possible cost per mile, remember that already 35 other leading roads and contractors, with the same objective, have carefully investigated, tried, tested and adopted the JACKSON MULTIPLE TAMPER. Many of them are repeat purchasers and now are using from 6 to 25 or more of these units. Doesn't this preponderant swing to the JACKSON MULTIPLE suggest the wisdom of investigating what this machine can do for you before buying any equipment for major ballasting purposes? We would be glad to have one of our thoroughly practical field engineers discuss the matter with you or send you literature and give you the nearest location where you can observe a JACKSON MULTIPLE TAMPER in action. Drop us a line.

IN THE VAST MAJORITY OF CASES NO SPOT-TAMPING OR FOLLOW-UP OF ANY KIND IS NECESSARY.



A high degree of visibility and quick removability from track make the JACKSON thoroughly practical under average traffic conditions.

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Mich.

and **WON'T** *if it's* **VAPOR-DRIED***

Checks and splits mark the doom of many a tie which might otherwise be good for years to come. They let in moisture and decay, as well as ballast particles which under the influence of shrinking and swelling, finally cause the tie to split apart. The result—replacement before the tie's normal life is realized.

Because Vapor-Dried* ties decrease checking and splitting, they last longer. And they save you money in other ways, too. Since they need no long air-seasoning period, inventories are reduced. You pay less for space, insurance, and interest on investment. "From trees to track in hours instead of months" is literally true with Vapor-Drying*. Another advantage: Vapor-Drying* lets preservatives penetrate deeper; makes it possible to use woods which normally are susceptible to early decay. And remember: Vapor-Drying* is good for all timbers and general purpose lumber as well as ties.

If you are responsible for maintaining track, you will want to know the whole story of Vapor-Drying*. So write today and ask us to tell you about it.

*Process Pat'd.

TAYLOR-COLQUITT CO.

SPARTANBURG, SOUTH CAROLINA

For additional information use postcard, pages 611-612

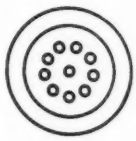
what's the best way

Heat treating rail ends

to recondition rail ends . . . frog points . . . faster . . . at lower cost

Building up frog points

Enlarged view of flame end of Style 739 Multi-flame tip, size 10. Also available in sizes 6 and 8.



— Use the new Airco Style 739 Multi-flame tip

Because with this new Airco "engineered" tip there is a more efficient transmission of heat to the work. Its speed, ease-of-operation and ease-of-handling has been pronounced excellent for welding, brazing, heating and rail end hardening operations. This durable, lightweight tip—known as Airco Style 739—has proved itself on various railroads throughout the country.

For a free demonstration of, or further information about, the new Airco Style 739 Multi-flame tip, write your nearest Airco office.

Costs Come Down Under The Airco Plan

AIRCO

AIR REDUCTION

Offices in Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Calcium Carbide Gas Cutting Machines, Gas Welding and Cutting Apparatus, and Supplies Arc Welders, Electrodes and Accessories

here's low-cost shelter that's up in a *Jiffy*

When you need more space, you'll find Armco STEELOX Buildings provide it quickly and at low cost.

One reason is that the STEELOX Sections provide both structural support and finished surface. A small crew of unskilled workmen can erect the building in a matter of hours. Labor costs are low.

You'll also find that STEELOX Buildings are fire-resistant and require practically no maintenance. There is nothing to crack, warp or rot. About all they ever need is an occasional coat of paint. Even then, the ZINCGRIP-PAINTGRIP Steel saves time and money because it can be painted immediately, and the paint lasts longer.

Armco STEELOX Buildings have all the advantages of any other permanent structure. Yet they can be quickly rearranged or dismantled and reassembled on a new site without loss of material. Even after several moves they remain rigid and weathertight. The patented joints can't open up or pull apart.

Try STEELOX construction the next time you need motor car garages, offices, bunk houses, and similar railroad structures. You'll save time and money. Write us for prices and complete information. Armco Drainage & Metal Products, Inc., 5190 Curtis St., Middletown, Ohio. Subsidiary of Armco Steel Corporation.

Export: The Armco International Corporation

ARMCO *STEELOX* BUILDINGS

ARMCO

Saves $400 in 4 hours!

ON ONE of its first jobs for the Alton & Southern R. R., this "Cat" No. 212 Motor Grader gave *tangible proof* of its value. Cutting down embankment – a task ordinarily costing – for labor alone – $400 plus – the No. 212 slashed the cost to $5.76. What's more, it shaved the working time from 2 days to 4 hours. And it's a rig you can keep busy all the time. Here you see it building a new road.

With the swing to trucks for track and road-bed maintenance, a "Cat" Motor Grader is a doubly useful and versatile tool. Besides building new roads along the right-of-way, it can turn its hand to grading them, removing snow, pulling ties and taking up track. And it does all this with a minimum of cost and down time. Another big advantage of using big yellow equipment is "Caterpillar's" excellent service. There are more than 300 dealer parts stores and shops in the U. S. and Canada. Get the full *facts* from your "Caterpillar" dealer today – he'll be glad to *show* you how "Cat" Motor Graders can slash costs for you!

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

LOOK UNDER THE HIDE OF "CAT" MOTOR GRADERS

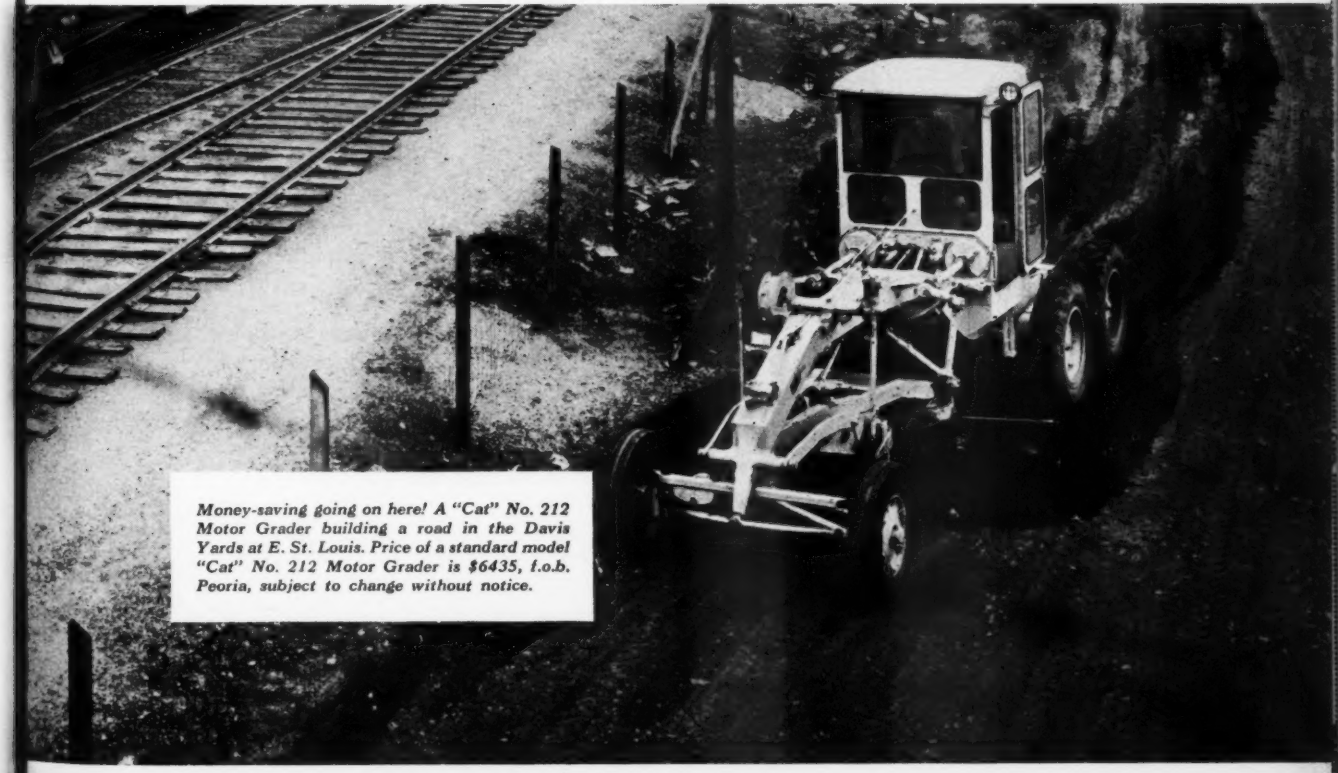
1. *Only* "Caterpillar" designs and builds the entire machine. This undivided responsibility assures long life and excellent parts service.
2. Each of the 3 sizes is a completely different machine. There's no performance penalty due to excessive frame weight or too little horsepower.
3. No other graders have the dependable yellow engine, famous for delivering 60-minute hours day after day.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS

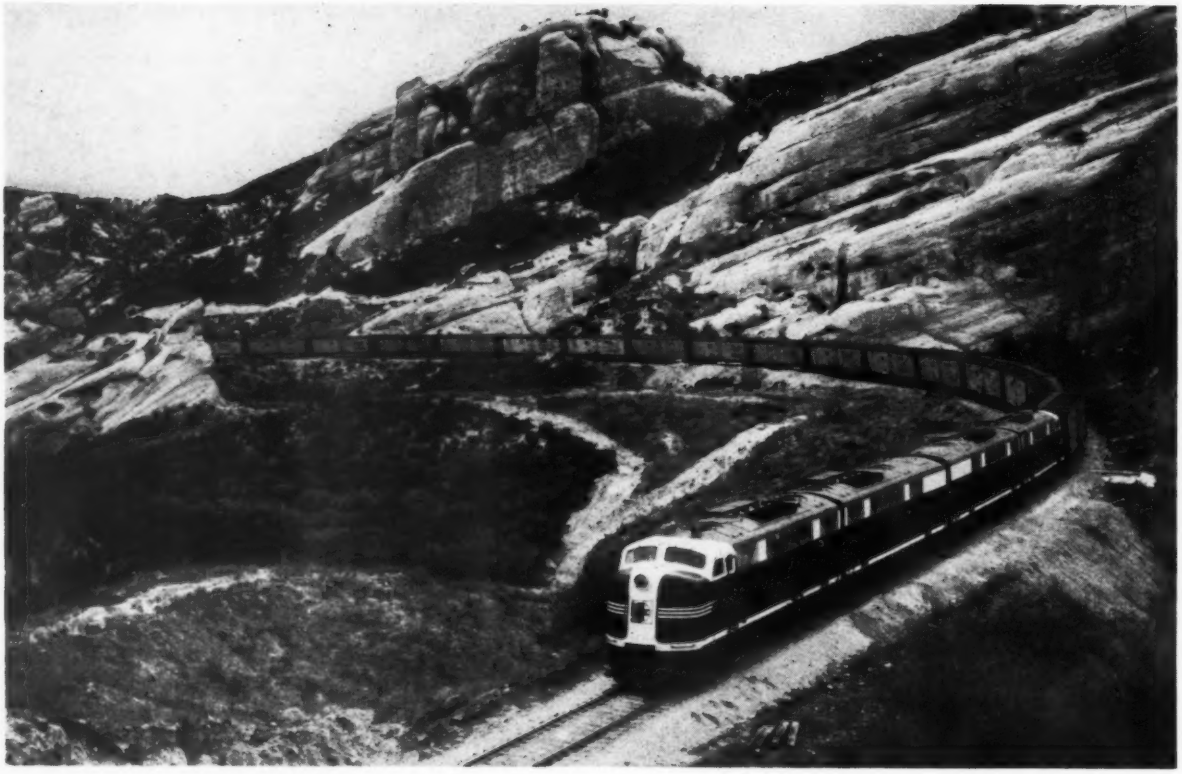
MOTOR GRADERS • EARTHMOVING EQUIPMENT



Money-saving going on here! A "Cat" No. 212 Motor Grader building a road in the Davis Yards at E. St. Louis. Price of a standard model "Cat" No. 212 Motor Grader is $6435, f.o.b. Peoria, subject to change without notice.

COMPRESSION

Rail Anchors



Adequate rail anchorage calls for provision against creepage in both directions. Compression two-way holding is providing just such economical protection—in every section of the country—on both large and small roads.

THE RAILS COMPANY

General Office
178 GOFFE STREET, NEW HAVEN 11, CONN.

ST. LOUIS, MO. HOBOKEN, N. J. CHICAGO, ILL.

ADDITIONAL INFORMATION

On Any of the Products Mentioned in This Issue

Below is a complete index of the products referred to in both the editorial and advertising pages of this issue. If you desire additional information on any of them, use one of the accompanying addressed and stamped postcards in requesting it. In each case give name of product and page number. The information will come to you directly from the manufacturer involved, without any obligation on your part.

Products Index

A

Adzing Machines ---- 624
Air Compressors ---- 598, 663, 679
Air Cooled Engines ---- 679
Air Dump Cars ---- 621
Aluminum ---- 615
Aluminum Jacks ---- 669
Aluminum Paint ---- 615
Anchors, Rail ---- 593, 610, 613, 620
Asphalt ---- 684
Asphalt-Cement Grouting ---- 684
Axes ---- 613

B

Ballast Cleaners ---- 600, 601, 614, 675
Ballast Cleaning Service ---- 675
Ballast Forks ---- 613
Blades ---- 613
Bolts ---- 680
Bonding Drills ---- 627
Bridge Coating ---- 619
Brushes ---- 623
Buckets ---- 631
Buildings, Steel ---- 608
Bulldozers ---- 617, 631, 666
Bunk Houses ---- 608

C

Car Stops ---- 681
Cars ---- 621
Chain Saws ---- 678, 679
Chemical Weed Killers ---- 599, 672, 674
Chemicals ---- 623
Clean Preservatives ---- 625
Clean Wood Preservatives ---- 625
Concrete Vibrators ---- 598
Corrosion Inhibitors ---- 619
Crane Carriers ---- 597
Cranes ---- 597, 603, 622, 628, 664, 673, 676, 679
Crankshaft Grinders ---- 681
Crawler Cranes ---- 622
Crawler Tractors ---- 617
Creosote Sprayers ---- 616
Cribbing Machines ---- 600, 601, 624
Crossings ---- 668
Culvert End Sections ---- 677
Culvert Pipe ---- 678

D

Diesel Electric Locomotive Cranes ---- 628
Diesel Engines ---- 598, 609, 617
Ditchers ---- 680
Draglines ---- 597, 622
Drills ---- 614, 627
Drills, Rotary ---- 598
Dump Cars ---- 621

E

Earthmoving Equipment ---- 609, 631, 680
Electric Plants ---- 680
Electric Tie Tampers ---- 605
Electric Tools ---- 598
Engines ---- 598, 679

F

Fence Tighteners ---- 677
Fire Protection ---- 602
Fire Retardant Treatment ---- 602
Flame Hardening ---- 607
Flangeway Cleaners ---- 616
Frog Plates ---- 595
Frog, Reconditioning ---- 607
Front End Loaders ---- 663

G

Gasoline Engines ---- 679
Generators ---- 666, 680
Glass ---- 623
Grinders ---- 679
Grinders, Crankshaft ---- 681
Grouting Lubricants ---- 684
Guard Rails ---- 595

H

Hammers ---- 613
Hatchets ---- 613
Heat-Treated Switch Points ---- 595
Highway Crossing Gratings ---- 668
Highway Crossings ---- 668
Hoists ---- 666
Hook Bolts ---- 680
Hydraulic Tools ---- 598

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Product and Page No. .....
" " " .....
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Name .....

Title or Position .....

Company .....

Address .....

City ..... Zone ..... State .....

I

Impact Wrenches ----598
Impactors ----598

J

Jacks ----669, 671
Jacks, Power ----624
Joint Bar Sealers ----652
Joint Oilers ----616

L

Lever Jacks ----669
Locomotive Cranes ----597, 603, 628, 676

M

Mobile Cranes ----597
Motor Car Garages ----608
Motor Cars ----616, 632
Motor Graders ----609

N

Nut Runners ----598
Nuts ----680

O

On-Track Tie Tampers ----600, 601, 605, 614
Oxy-Acetylene Service ----604

P

Pads ----618
Paints ----615, 666
Paving Breakers ----663
Pentachlorophenol ----625
Piles ----629
Pneumatic Tools ----598
Post Hole Diggers ----663
Power Jacks ----624
Power Units ----617, 680
Prefabricated Buildings ----608
Pullshovels ----597
Pumps ----598, 666, 677, 681

R

Rail Anchors ----593, 610, 613, 620
Rail Braces ----595
Rail Coating ----619
Rail Cranes ----673, 676
Rail Drills ----614, 624, 627
Rail Flaw Detectors ----664
Rail Forks ----613
Rail Grinders ----624, 679
Rail, Reconditioning ----607
Rail Saws ----627
Rivet Busters ----598
Road Rollers ----678
Rock Drills ----598
Roller Bearings ----634
Rollers, Road ----678
Rotary Pumps ----681
Rotary Sweeper Brushes ----663
Rules ----678
Rust Preventives ----619, 667

S

Sand-Drying Equipment ----677
Saws, Chain ----678, 679
Saws, Electric ----598
Saws, Rail ----627
Scaling Tools ----598
Screw Spike Drivers ----614
Scuffle Hoes ----613
Scythes ----613
Shovels ----597, 622, 631, 673
Snow Plows ----631, 663
Spike Hammers ----598, 624
Spike Pullers ----624
Sprayers ----679
Spreader-Ditchers ----680
Spring Washers ----594, 620, 661, 683
Steel Buildings ----608
Steel Crossing Gratings ----668
Steel Piles ----629
Surfacing Jacks ----671
Switch Points ----595
Switch Stands ----595

T

Tampers ----598, 600, 601, 605
Tapered Roller Bearings ----624
Tapes ----678
Tie Cutters ----616
Tie Drills ----614
Tie Drying ----606
Tie Pads ----618
Tie Plate Spacers ----616
Tie Tampers 598, 600, 601, 605, 614, 627, 649
Tools, Precision ----678
Track Jacks ----669, 671
Track Shifters ----624
Track Shovels ----613
Track Tools ----620
Tractor Attachments ----663
Tractor Compressors ----663
Tractor-Loaders ----631
Tractors ----609, 617, 631, 663, 678
Treated Ties ----606
Trench Hoes ----631
Truck Cranes ----597, 622, 673
Tubular Piles ----629
Turbine Pumps ----681

U

Unit Tie Tampers ----627

V

Vacuum Pumps ----598
Valves ----596

W

Washers, Spring ----594, 620, 661, 683
Water Columns ----596
Water Testing Kits ----667
Water Treatment ----667
Weed Burners ----616
Weed Cutters ----613
Weed Killers ----599, 672
Weed Killing Chemicals ----599, 674
Weed Killing Service ----599, 674
Welded Rail ----604
Welding Rods ----604
Well Water Systems ----681
Winches ----598, 663
Wire Brush Machines ----598
Wood Borers ----598
Wood Preservatives ----606, 625
Woven Wire Fencing ----677

RAILWAY ENGINEERING AND MAINTENANCE July, 1950

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Product and Page No. .....

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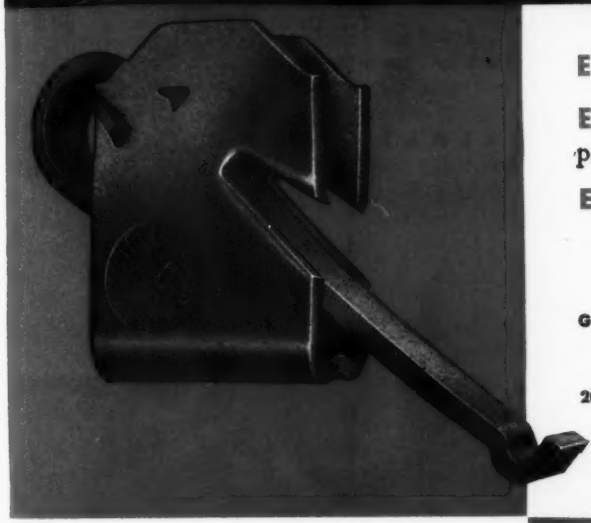
The New '50 TRUE TEMPER RAIL ANCHOR

Photo Courtesy Southern Railway System



EFFICIENT—Easy to apply—easy to remove

ECONOMICAL—Cannot be overdriven—especially adapted to worn and corroded rail bases

EXCLUSIVE—Made and sold only by:

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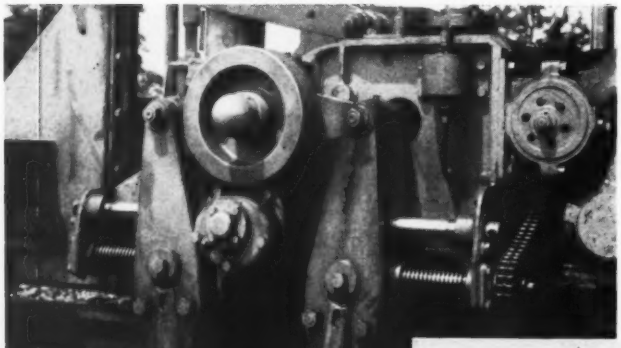
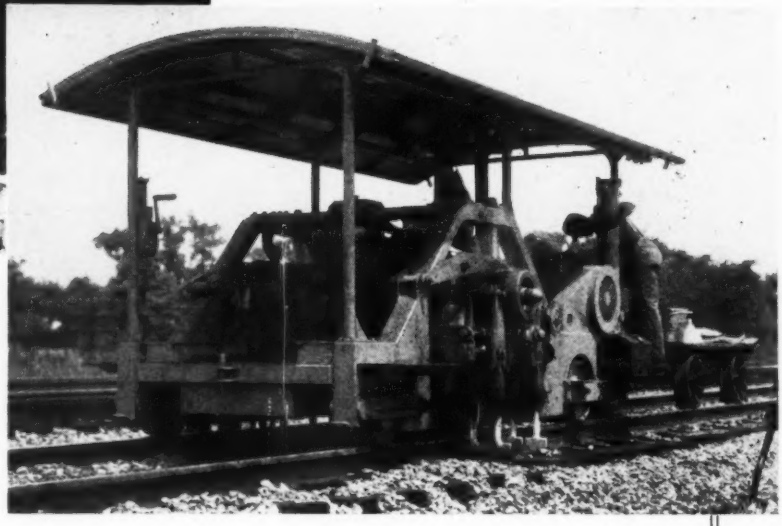
These MATISA machines will give you



BETTER TRACK at LOWER COST



MATISA
AUTOMATIC
TIE TAMPER

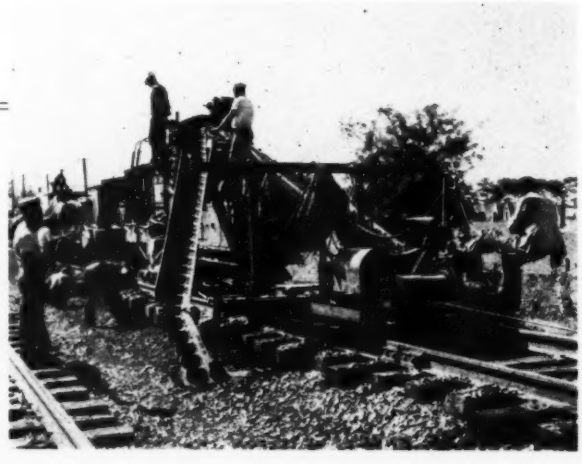
A self-propelled unit requiring only one man to operate, the MATISA Automatic Tie Tamper works at the rate of 350 to 600 ft. of track per hour.

The machine mounts two complete tamping mechanisms, one over each rail, each separately controlled. Each tamping unit comprises eight tamping tools, four inside and four outside the rail. The opposed pairs are positioned on each side of a tie, vibrating rapidly while being forced toward each other, until the desired compactness of ballast under each tie is obtained.

ALSO
Universal Bolt and
Tie Screw Driving Machines
Rail Drilling Machines
Tie Drilling Machines
Pulsators
Motor Rail Trucks

MATISA AUTOMATIC BALLAST CLEANER

This self-propelled on-track machine cleans up to 400 lineal feet of track per work hour. An endless scraper chain is run beneath the track structure, elevating the ballast to a series of conveyors and screens where it is cleaned and returned to the roadbed, while the waste dirt is ejected clear of the tracks.



Full details and work records on request.

The MATISA
EQUIPMENT CORPORATION
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EQUIPMENT COMPANY
58 Victoria St., London S.W.1, England
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High speed track, in top trim, contributes importantly to the performance of crack trains like the "Empire Builder". On the Great Northern, tie replacement is speeded up by the use of WOOLERY Tie Cutters which eliminate trenching, jacking up track, or adzing the tops of rail cut ties.

The WOOLERY Tie Cutter and Undercarriage enables one man to quickly cut each worn tie into three easily-removable pieces which can be lifted out without disturbing the ballast, so that new ties may be re-seated on a firm bed. With this modern machine the entire cutting operation is performed without lifting or turning, by traveling the cutting mechanism across the undercarriage to cut both ends of the same tie, and rolling the whole apparatus along the rails to successive tie positions. Total cutting time per tie is less than two minutes.

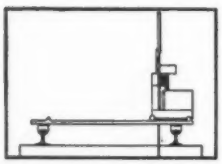


Figure 1—Making first cut at right end of tie, close inside rail.

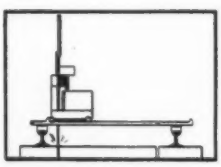


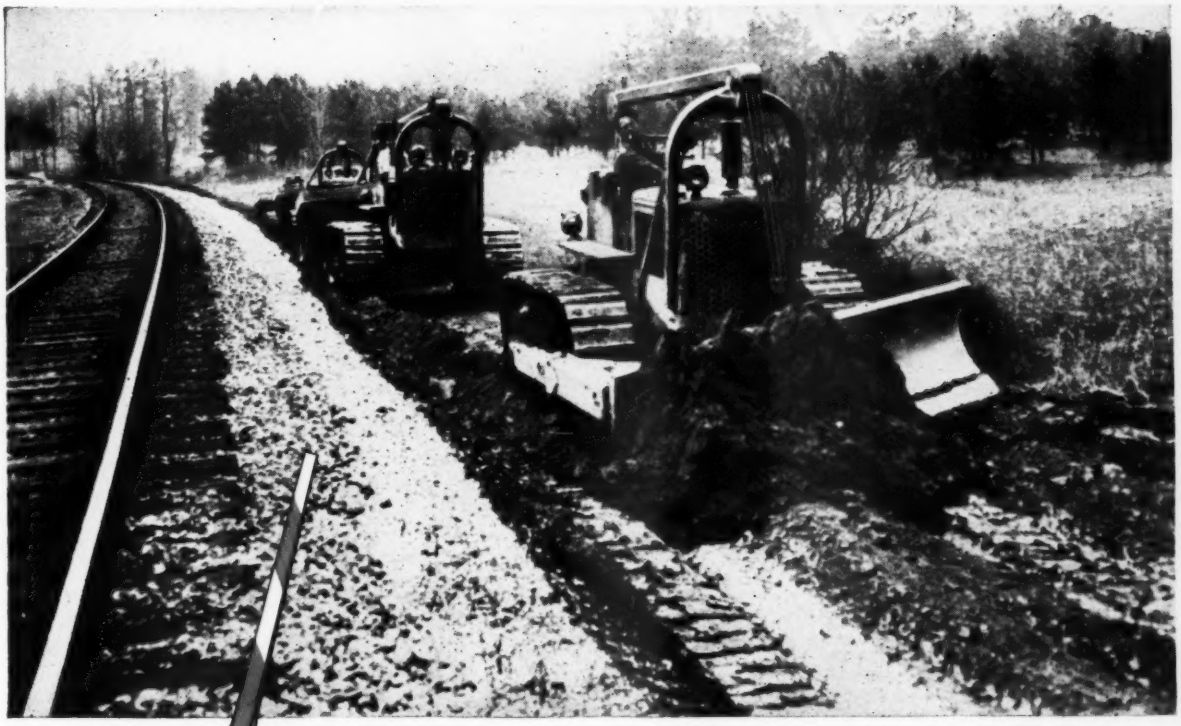
Figure 2—With machine moved to left end of tie, making second cut.

OTHER WOOLERY MAINTENANCE UNITS

Weed burners, creosote sprayers, motor cars, flangeway cleaners, tie plate spacers, rail joint oilers.

Write Now for brochure and complete information.

WOOLERY MACHINE COMPANY
MINNEAPOLIS MINNESOTA
Pioneer Manufacturers of **RAILWAY MAINTENANCE EQUIPMENT**
RAILWAY WEED BURNERS • MOTOR CARS • FLANGEWAY CLEANERS • TIE CUTTERS • TIE PLATE SPACERS • RAIL JOINT OILERS • CREOSOTE SPRAYERS
EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., NEW YORK, N. Y.



THE International FLEET'S IN—
on main line maintenance of way

Wherever there are big dirt moving jobs along the right of way, more and more railroad maintenance men are turning to fleets of International Crawlers to handle the work. Here is a big track relocation project for a southern railroad and the power on the job is entirely International.

You can't beat International Crawlers for all 'round performance and real economy of operation. Railroads are finding International Power pays off in work done. And there's little or no interruption of normal traffic when International off-the-track power is on the job.

Contact your International Industrial Power Distributor and find out how International Crawlers can do more for you on construction and maintenance of way work. You'll find dependable International tractors for every kind of work on the railroad, from the yards and shops to the main line. And every International is designed and built to deliver more work at less cost. It will pay you to get the International fleet now.

INTERNATIONAL HARVESTER COMPANY • Chicago

Standardize on Power that Pays

INTERNATIONAL HARVESTER

INTERNATIONAL INDUSTRIAL POWER

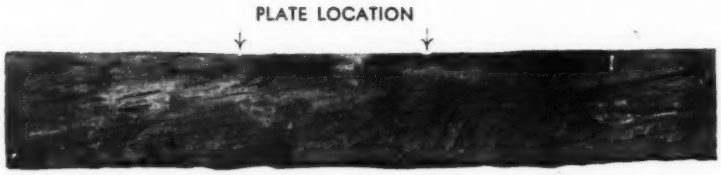
CRAWLER TRACTORS • WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS

WHAT HAPPENED to a Railroad Tie WITHOUT any Tie Pad

This creosoted hardwood tie was installed on a main line curve on a grade without a pad beneath the tie plate. The photograph is of the inner end of the tie and shows plate cutting of .56 in. after 8 years of service.

-and WITH a Resilient Tie Pad

This creosoted hard wood tie was installed near the one above, with one of our resilient tie pads made of cotton and rubber used beneath the plate. The Photograph is of the inner end of the tie. Plate cutting amounted to only .06 in., a reduction in wear, from the tie shown above, of 89%, after 8 years of service.



17 ADVANTAGES OF FABCO TIE PADS

1. Prevent cutting of ties by plates.
2. Extend tie life.
3. Reduce labor costs by less frequent tie renewal.
4. Maintain gauge.
5. Save labor of re-gauging.
6. Have exceptionally long life — comparable to tie life.
7. Withstand extremes of temperature, moisture, brine, sand.
8. Do not squash or crush under extremes of temperature or long service.
9. Have great strength under load.
10. Permanent resiliency assures tight spikes.
11. Resilient winter and summer.
12. Cushion track structure from impacts.
13. Assist in maintaining line and surface.
14. Reduce need for larger tie plates.
15. Compensate uneven bearing surfaces.
16. May be transferred from one location to another.
17. Low pad cost.

Long pad life plus extended tie life insure large maintenance saving.

On bridges, switches, curves and station track the use of Fabco Tie Pads is economically sound. No better method exists to prevent mechanical wear of ties, extend tie life and cut the high costs of tie maintenance.

Write for latest Information

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NEW YORK CHICAGO DETROIT
PHILADELPHIA SPARTANBURG, S. C.
OAKLAND, CALIF.

ON BRIDGES, SWITCHES, CURVES AND STATION TRACKS

It Pays to Specify FABCO TIE PADS
WRITE US TODAY

For additional information use postcard, pages 611-612

MULTI-PURPOSE

NEW TYPE COATING

1. Prolongs rail life

2. Cuts railway maintenance costs

Rust-Chek

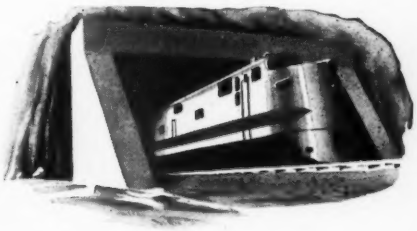
CORROSION-RESISTANT COATING

...resists water, salt and acid fumes

RUST-CHEK was originally developed by the Rinshed-Mason Company to prevent the notoriously excessive corrosion of railway track in tunnels. Applied to the web and base of rails, Rust-Chek prolongs rail life where the going is rough; is unaffected by the impact of train wheels and the consequent flexing of the rails.

Today, Rust-Chek is finding ever widening acceptance for numerous other railway applications, but especially where corrosion conditions are severe, for Rust-Chek possesses exceptional resistance to water, salt and acid fumes; retains, with long years of service, unusual qualities of flexibility and adhesion that definitely prevent cracking, chipping or peeling.

Investigate now! Skilled R-M engineers to assist you.

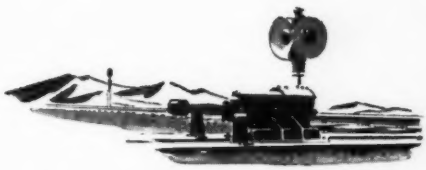


PREVENTS EXCESSIVE RAIL CORROSION

Salt, water and acid fumes often cause frequent and costly rail replacement. Rust-Chek prevents excessive corrosion, but especially in certain tunnels; on rails subjected to brine drippings from heavy refrigerator car traffic; on rails running close to salt water, at grade crossings, etc.

PROTECTS BRIDGES AND STRUCTURAL STEEL

Bridges, round-house structural steel, etc., can be quickly and easily coated with Rust-Chek, adding countless years of life and greatly lengthening time between coats. Rust-Chek puts up a solid front against salt spray, locomotive fumes and moisture.



PROLONGS LIFE OF COSTLY EQUIPMENT

Signalling equipment, water towers, steel boats, barges, buoys, docks, and numerous other types of railway-owned equipment, need Rust-Chek protection for greatly prolonged service life. Unusually tough and highly water resistant, Rust-Chek is easy to apply, calls for no special equipment and may be either brushed or sprayed.

Write for DESCRIPTIVE FOLDER

Free Descriptive Folder and specifications will be sent you on request. Test sample will also be forwarded if wanted. *Write now.*

RINSHED-MASON CO.

5935-71 MILFORD AVE. . . . DETROIT 10, MICH.

Rugged Dependability *Today and Tomorrow*

With

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RAIL ANCHOR

More RUGGED in Every Respect!

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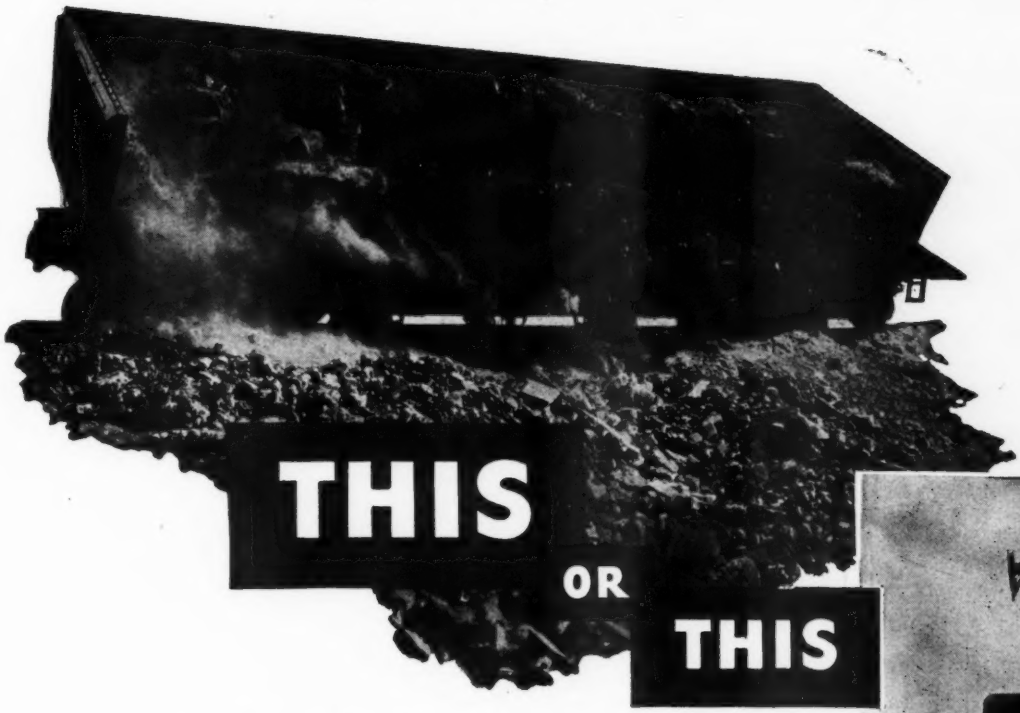

The Difference is $2600 a year per car!

That's a lot of difference.

Especially when you consider that it represents net savings from just *one* car in *one* type of maintenance-of-way service.

Look at it this way—

It takes time and skilled labor to unload worn-out, obsolete air dump cars or to unload gondolas with a crane. But it takes *less than a minute* for anyone to dump a fully loaded Magor Automatic Air Dump Car.

Figure that your work train costs about $200 a day. That includes time, labor and equipment. By replacing gondolas or old air dump cars with New Magor Automatic Air Dump Cars, you save at least an hour a day. That's your $2600 a year savings.

But you'll use your new Magor Air Dump Car for more than just one type of service. Probably everything from ditching to snow removal. And in every operation you are cutting time and labor costs.

Cutting work train costs is just one part of the story. Years of research, experience, field tests and top engineering skill are incorporated into the new Magor Automatic Air Dump Car. They'll operate efficiently and dependably under all conditions.

AVAILABLE TO MEET YOUR BUDGETING PROBLEMS

Magor maintenance-of-way Automatic Air Dump Cars are available on the following terms:

1. By rental on long term lease.
2. By rental with purchase option.
3. On installment terms
4. By outright purchase

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Heavy lifts
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Emergency fueling and wrecking service
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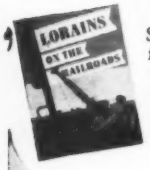

"Lorains on The Railroads"

Send for this free folder showing Lorain's service record with the railroads—how you can save with Lorain!

Here's streamlined railroading at the Springfield, Missouri reclamation plant of the St. Louis-San Francisco Railway Co. A Lorain "TL" crane with a magnet, handles scrap and company supplies. As many as 200 tons per 8 hour day get a lift with this Lorain.

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● **Pittsburgh SNOLITE** is a specially prepared fume-proof white paint for crossing gates, signs, fences, cattle guards and for all other places where top visibility is of utmost importance.

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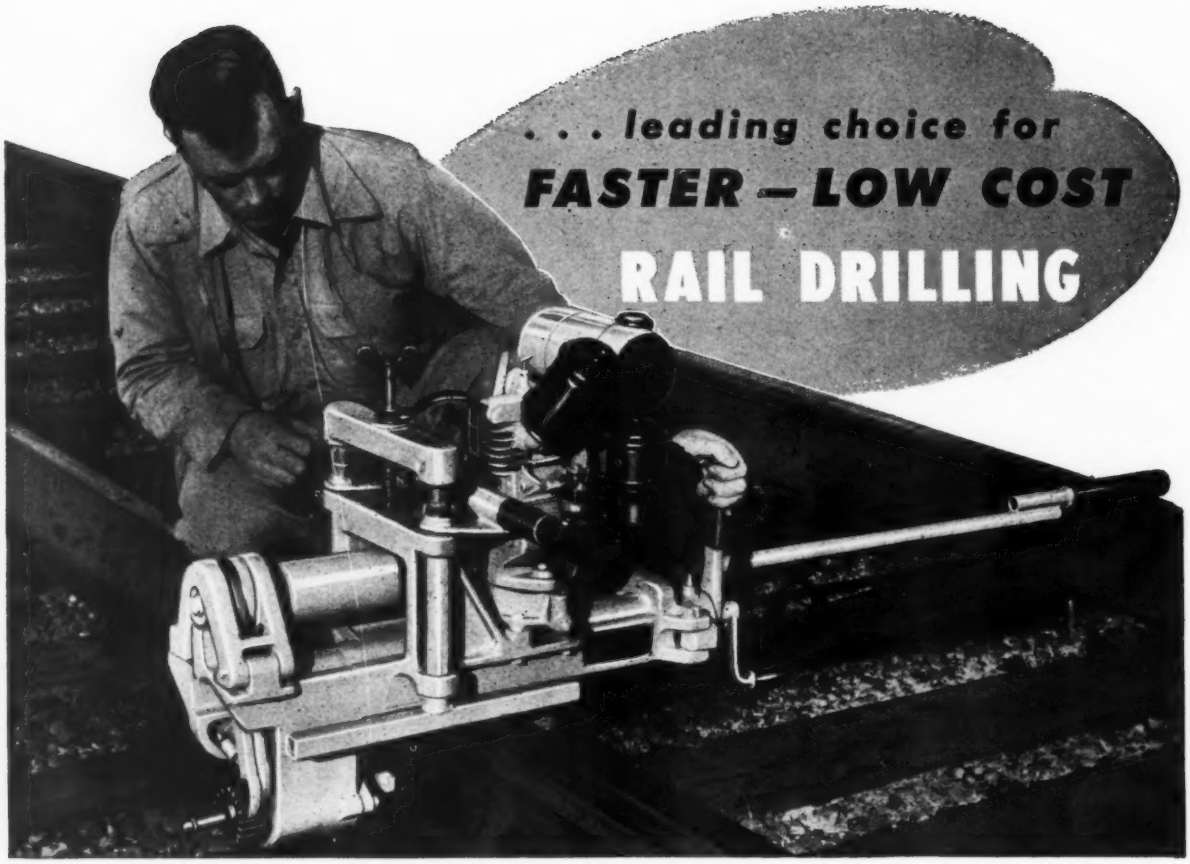
the NORDBERG RAIL DRILL



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★ **EASILY SET UP**
No part of machine rests on ties or ballast. High ballast, ice, snow, or unequal tie level are no problem. Correct drilling location instantly obtained from top of rail.

★ **HEAVY DUTY PERFORMANCE**
Although light in weight, simplicity of design and quality construction make this drill more rugged than heavier models.

★ **LIGHTWEIGHT**
Thru use of aluminum frame and other special design features, total weight is only 132 pounds.

★ **VERSATILE**
14 inch spread permits drilling at switch heels, frogs and guard rails.

★ **CHUCK SIMPLICITY**
No tools required to install or remove bit.

★ **LOW PRICE**
Justifies locating a Nordberg Drill even at points where only occasional holes are drilled.

Investigate your hand drilling costs. Check them against the Nordberg Model CD which drills a 1⅛ inch hole in less than a minute. You just can't *afford* to waste valuable man hours drilling bolt holes in rail by hand methods. Write for Bulletin 157.

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NORDBERG TRACK MAINTENANCE MACHINES
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DECKING is

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THE CLEAN WOOD PRESERVATIVE

It will pay you to treat your decking with PENTAchlorophenol—the clean wood preservative.

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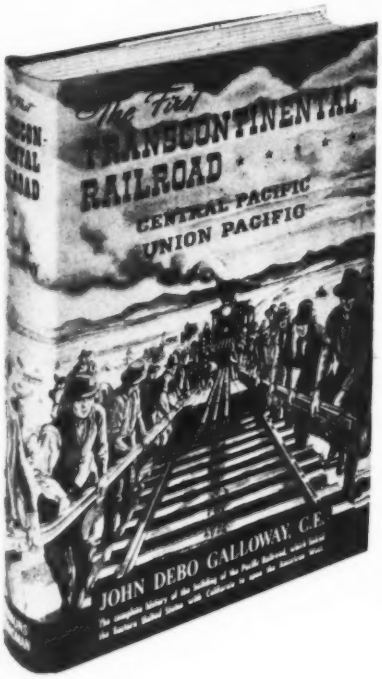

By JOHN D. GALLOWAY, C.E.

The construction of the Union Pacific and Central Pacific railroads linking Omaha with Sacramento was the crowning achievement of the railroad era. It was considered by the author the greatest engineering project of the Nineteenth Century.

The author for more than forty years was a leading consulting engineer of San Francisco. He was thoroughly familiar with the original routes of both railroads. While gathering manuscript material he carried on an extensive correspondence with relatives of the builders. Many of the authentic photographs showing construction methods were from his private collection.

The individual contributions of railroad engineers, construction company heads and railroad officials who had a part in this great project are objectively appraised. Biographical sketches of the more prominent engineers and railroad builders of the era are included.

Contents

The Pacific Railroad—The Origin and Development of Railroads Prior to 1870—Early Projects and the Pacific Railroad Surveys—The Builders of the Central Pacific Railroad—The Central Pacific Railroad Company—Locating the Central Pacific Railroad—Constructing the Central Pacific Railroad—The Builders of the Union Pacific Railroad—The Union Pacific Railroad Company—Locating the Union Pacific Railroad—Constructing the Union Pacific Railroad.

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Reviews

"The story of these railroads had been told many times. However, few authors approached the Herculean project with the same appreciation of the problems involved as has Galloway. You are left with the firm belief that building this first transcontinental railroad was truly the greatest engineering feat of the 19th Century." **Engineering News-Record.**

"At Promontory, Utah, there stands a great stone monument to the Last Spike which joined the two branches of this nation's first cross-continental railroad. The story of the Central Pacific's long trek over the Sierras from Sacramento eastward and of the corresponding labors of the Union Pacific's workers who worked west from Omaha is one of the greatest chapters of nineteenth-century progress. This story, this epic of Americana, is told from the viewpoint of a civil engineer. **—The Argonaut.**

"Galloway rates as one of the great engineers who had an important part in the development of Western America. As an authoritative record of one of the nation's greatest engineering achievements, his book is a basic contribution to the literature of American railroading."—**Southern Pacific Bulletin.**

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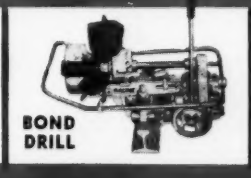

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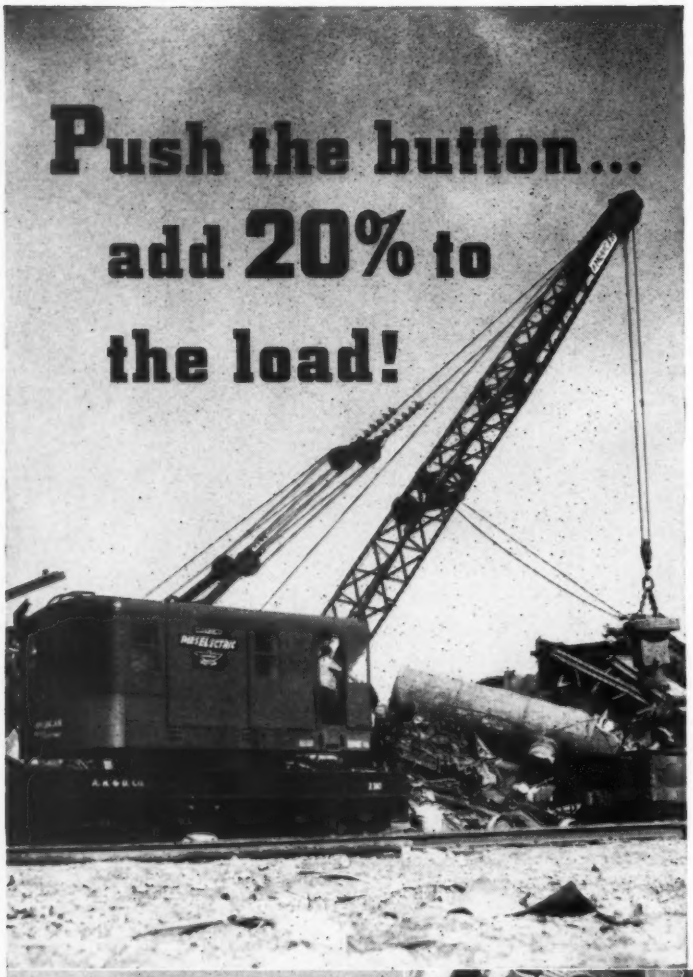
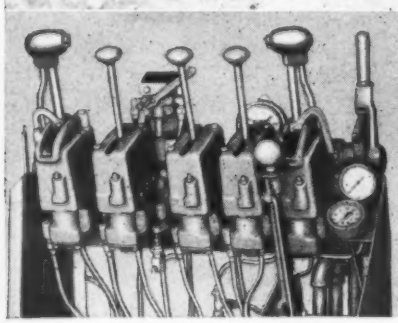


Side by side, two locomotive cranes loaded scrap at one of the big steel mills. Each made exactly the same number of passes with the same size magnet. Then the scrap was weighed . . . and the new American crane had moved 20% more material, by weight, than an older crane of the same rated capacity.

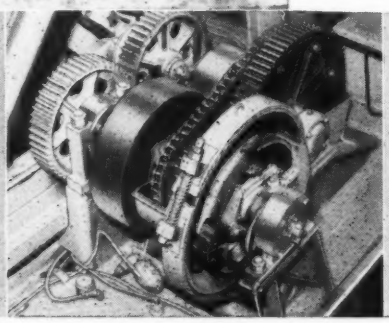
The difference? *Over-excitation* . . . an instantaneous extra shot of power to the magnet, which then lifts and holds with the same force as though magnet size were increased by 20%!

This great feature is yours on any American Locomotive Crane —all capacities. Your choice of power—including the great new DiesELectric. Want more facts? Mail the coupon for illustrated catalog.

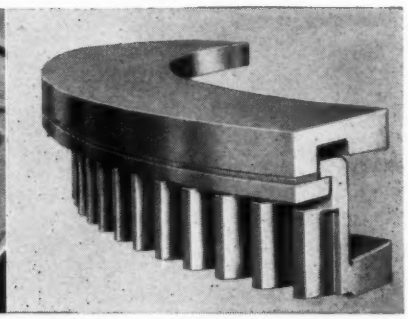
★ Diesel-Electric Locomotive Crane Patent No. 2083460. Touch Control Patent No. 2370856.



Push Button Controls...
On hoist and slewing levers, make easy, effortless magnet work. For over-excitation, just hold pick-up button an instant. To unload, push the other button. No need to ever take hands off main control levers.



Patented Boom Hoist
Maximum flexibility due to ability to raise or lower boom while hoisting, swinging or traveling. Boom can be raised from maximum to minimum radius in less than a minute. Photo shows unit with gear cover removed.



Interlocking Gib Ring
has done away with weak, unstable center king pin on all American cranes. Eliminates rocking, teetering, tipping. Distributes weight of machinery and load on a fully-enclosed 9-foot roller bearing.

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Plant No. 2: SO. KEARNY, N.J.

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St. Paul 1, Minnesota 5601

● Please send catalog on American Locomotive Crane.

Capacity_____ tons. Type of work:_____

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Company_____

Address_____

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Overpass at Cadiz, Ohio. Contractor: The W. M. Brode Co., Newscomerstown, Ohio.

IF you're looking for ways to save time and money on foundation costs, see what Monotubes did on this job—an overpass for carrying coal cars from a strip mine.

Savings began right from the start. For these Monotubes were driven with a light, mobile truck crane. No additional equipment was needed to drive the piles to close tolerance on two batters.

And, as you can see, the concrete volume in the finished piers was materially reduced. A great saving . . . and further proof of Monotubes' inherent strength and lateral stability.

Monotubes have many more advantages that mean savings. They're light in weight, easily handled. They're easily extendible. There's minimum cut-off waste. One-piece construction minimizes water and pumping hazards. They're available in lengths, gauges, tapers and diameters for varying soil conditions. Jobs started with Monotubes can be *completed* with them.

For information, write The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Foundation Piles

No. 259 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION
79 W. MONROE STREET
CHICAGO 3, ILL.

Subject: A Larger Magazine

July 1, 1950

Dear Readers:

Like any other commercial product, magazines must constantly be undergoing a process of improvement to assure the purchaser—whether subscriber or advertiser—a full measure of value for his money. We of the staff of Maintenance never for a moment permit ourselves to forget this responsibility, and as a consequence nearly every month some improvement is made over previous issues.

Some of these changes are minor; others are major in that their effect is immediately apparent even to the casual observer. For instance, you need only to glance at this issue to see that the size of the magazine has been materially increased. To be specific, the trim size is now 9 in. by 12 in., which compares with 8 1/4 in. by 11 1/4 in. previously. This means that the area of each page has undergone an increase of more than 16 per cent.

The primary purpose of going to the larger size has been to enhance the "eye appeal" of the magazine. In its external aspect the magazine is now a more attractive "package" for the contents. Let's open the package to the editorial section. You will notice immediately that individual pages have a greater impact than before. This is partly due to the wider margin of white space around the edges of the pages. The larger engravings that can be used when they are "bled" off the edges of the page are also a factor. Note, for example, the engravings on pages 640 to 642, inclusive. the new page size made it possible to "blow up" these cuts to a generous size without reducing the amount of space available for text. Also, the larger space allows greater flexibility in arranging text and illustrations, and hence will make it possible for us to give you a more attractive, interesting, and easier-to-read magazine.

These comments apply with equal force to the advertising pages. The objective of any advertisement is to convey a message to the reader. The larger page size provides a more effective medium for achieving this objective, even if the advertisement occupies only the standard 7-in. by 10-in. area on the page. If the advertiser wishes to "bleed" his advertisement the larger trim size gives him a more capacious showcase in which to display his wares.

The new trim size was adopted for the entire family of Simmons-Boardman railway publications only after careful study of all factors. The conclusion was that a 9-in. by 12-in. magazine is the optimum size, that is, it is sufficiently large for maximum effect without being unwieldy. We hope you will be pleased with this new evidence of our desire to give you the best magazine which we are capable of producing.

Yours sincerely,

Merwin H. Dick

MHD:ag

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

HOW TO Handle a Variety of Jobs on a Single, Lower Investment

—USE THE **Allis-Chalmers HD-5G and Tracto-Shovel Interchangeable Attachments***

You can build up shoulders — place ballast — handle ties — transport and lay rail — dig, carry, dump and spread any kind of material — build and maintain access roads — remove brush — plow snow or load it — cut costs on dozens of other jobs — all with this standard machine and one or more specially designed attachments. Start now to stretch your budget . . . investigate!

The HD-5G Tractor is available with semi-grouser, full grouser and rubber-faced track shoes as well as the flat shoes shown above.

The Most Advanced Tractor in its Power Class . . . . .

BIG WORK CAPACITY—This completely new smaller tractor has big tractor design, balance and stamina . . . surprises users everywhere with its performance. As owners say, "You've got to see it to believe it."

JUST THE RIGHT SIZE—to efficiently handle a wide variety of jobs. Has 11,250 lb. of properly balanced weight (tractor bare) . . . 40.26 drawbar hp. provided by the smooth-running, economical, 2-cycle GM Diesel engine—every down stroke a power stroke!

NEEDS LESS GREASING THAN AN AUTOMOBILE — Instead of hitting a dozen or more grease fittings every shift, you lubricate only one fitting every two weeks, two other fittings every five weeks (based on 40-hour weeks). *And you operate a full 1,000 hours* before replenishing lubricant in truck wheels, track idlers and support rollers.

SIMPLE TO SERVICE—All adjustments are unusually accessible. Major assemblies are removable without disturbing unrelated parts — engine, clutches, transmission, etc. There's less downtime — more time working . . labor and repair costs are reduced.

BUILT-IN SAFETY AND CONVENIENCE—Easier steering and shifting with convenient controls, full vision. Cushioned seat, wide arm rests. Operator gets more done because it's easier to do more!

Write for literature or ask your Allis-Chalmers dealer for a demonstration!

*These 14 Tracto-Shovel Attachments

Can be Interchanged in but a Few Minutes

The usefulness of the HD-5 Tractor is further widened by other allied equipment: 2-wheel scrapers, rippers, rollers, cranes, skid loaders, canopies, winches and log carts.

ALLIS-CHALMERS

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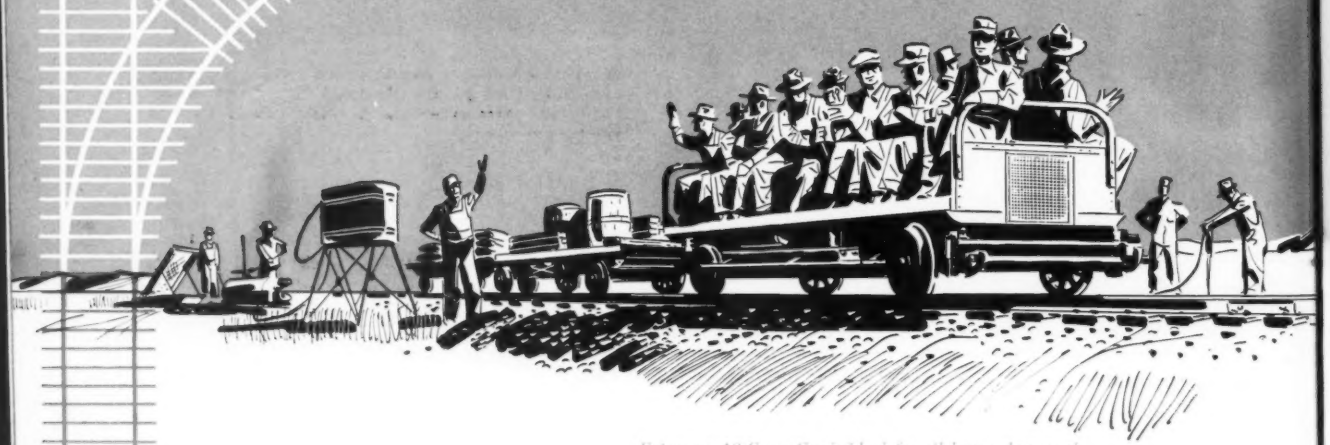
For Greater Production . . . For Easier Operation . . . For Simplified Servicing

Fairmont

RAILWAY MOTOR CARS
AND WORK EQUIPMENT

. . . . at work wherever speed and efficiency are required



Fairmont A8 Gang Car is ideal for all heavy duty work. Seats 14 men. Four-wheel—propeller shaft—enclosed gear drive. Designed for rugged and tough hauling jobs.

The past half-century has seen many remarkable changes in railroad operation—and paramount among them is the *speed* of railway maintenance. Jobs that once required days of hard labor are now performed by men and machines in a matter of hours. This transition from slow manual labor to fast mechanical operation owes much to the research and pioneering of Fairmont—the world's largest manufacturer of railway motor cars and work equipment. For over 40 years, Fairmont has worked unceasingly to find better and faster ways of maintaining the nation's roadbeds. The success of this work is reflected in every Fairmont product today—and in their acceptance as the standard wherever fast, efficient maintenance is a necessity.

Performance ON THE JOB COUNTS

FAIRMONT RAILWAY MOTORS, INC., FAIRMONT, MINNESOTA

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Railway Engineering and Maintenance

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VOL. 46, NO. 7 JULY, 1950

Editorials ---- 635
The Cold War — Fire Losses — Tie Renewals

Preassembly Speeds Renewal of Lap-Lead Ladders ---- 637
S. H. Shepley outlines the interesting procedures used by the Elgin, Joliet & Eastern in renewing involved track layouts in its Joliet yard

Protective Coatings Cut Open-Deck Bridge Fires ---- 640
Discusses the experience of the Southern Pacific—Pacific Lines with applications of asbestos-impregnated asphalt covered with stone chips

Open-Grating Highway Crossing Is Easily Removable ---- 642
Gives the features of a design used on the Erie, which in no way interferes with normal track drainage or necessary track tamping

Pentachlorophenol—Its History as a Wood Preservative ---- 644
Traces the background of this compound and summarizes its applications, with special reference to its uses in the railroad field

The Safety Habit Is a Matter of Education ---- 646
Abstract of a paper presented by J. P. Datesman before the Midwest Regional Conference of the Safety Section of the A.A.R.

Diesel Steam Generators Present Complex Water Problems ---- 647
Abstract of a paper presented by J. F. Wilkes before the Midwest Power Conference, sponsored by the Illinois Institute of Technology

High-Cycle Electric Tool Enters Tie-Tamping Field ---- 649
Describes a new unit designed for operation by any portable generator producing 180-cycle, 230-volt current

This Station Features Modern Design, New Materials ---- 650
Describes the Rock Island's new station at Duncan, Okla., with special reference to an unusual arrangement of waiting room partitions

Machine Developed for Applying Rail-Joint Plugs ---- 652
A report on a unit for sealing, with a plastic compound, the openings at joint-bar ends against the entrance of debris, brine and water

Economic Repairs of Railroad Tunnels ---- 653
W. P. Geiser sets forth his understanding of the basic principles essential to the safe and economical execution of this type of work

What's the Answer? ---- 656
Grade Stakes for Raising Tracks — Building by "Modular Co-ordination"
Tightening Strands for Fencing — Using Diesel Fuel-Oil Meters
Proper Care of Paint Brushes — Using Locomotive Cranes on Curves
Law Suits from Bridge Reconstruction

Products of Manufacturers ---- 664

What Our Readers Think ---- 668

The Month's News ---- 670

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How to take gandy dancers to work in jig time

WORK crews delayed by section car breakdowns represent lost time and money. To prevent such delays, Fairmont S2 Series H standard section cars are equipped with Timken® bearings on the idler pulley and axles. Timken bearings reduce maintenance costs, virtually eliminate friction.

Timken bearings take radial and thrust loads in any combination. Line contact between the rollers and races gives extra load-carrying capacity. Wheels and shafts are held in positive alignment. And the advanced design of Timken bearings permits tighter closures to keep lubricant in, dirt and water out.

Timken tapered roller bearings are precision made and finished to incredible smoothness. They normally last the life of the car because they (1) are engineered for the job, (2) are made of Timken fine alloy steel, (3) are precision manufactured.

No other bearing gives you *all* the advantages you get with Timken bearings. Insist on them in all the equipment you buy or build. There's no other bearing with so much to offer—no other bearing so fully proved! Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian Plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

FAIRMONT RAILWAY MOTORS INC. *assures long life and trouble-free performance with Timken bearings on the idler pulley and axles of this Fairmont S2 Series H standard section car.*

WE MAKE OUR OWN STEEL

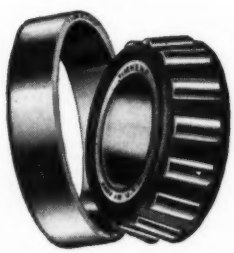
The special grade alloy steel which gives Timken bearings their strength and resistance to wear, is made in our own steel mills.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION ✳

The Cold War —

Railroad Supervisory Personnel Can Help Win It

The world is now witnessing a titanic struggle between our system of personal liberty and private enterprise on one hand and, on the other, foreign ideologies that magnify the state and submerge the individual. At the moment this struggle is not being fought with bullets or atomic bombs; for want of a better name the term "cold war" has been invented to describe the present state of international affairs in which one side, soviet Russia, is applying relentless diplomatic pressure while playing a waiting game—waiting with the confident expectation that eventually our economy will collapse and, with it, all resistance to the march of communism.

Hence, to win the cold war it is necessary to keep our economy so healthy that a serious depression will be out of the question. If the truth of this statement were recognized by the majority of the people the danger would be minimized. Then the President and the Congress would be forced by the pressure of public opinion to balance the national budget, to eliminate waste and corruption in government, and to foster policies designed to strengthen private enterprise. However, the sad truth is that, in return for governmental "favors," large groups have deliberately closed their eyes to the many harmful policies now being practiced by various branches of government. Not only this, many individuals—millions of them, in fact—are pursuing policies, motivated by selfish considerations, which are helping to undermine our system of free enterprise.

Every time a union forces an employer to make concessions in the form of higher wages or shorter hours which are not matched by higher productivity per worker, the members of that union are guilty of having helped to drive another nail in the coffin of free enterprise. Business men are guilty of the same thing when they enlist the aid of the government in securing unfair advantages over their competitors. In either case the individuals involved would doubtless be incensed if they were accused of playing into the hands of the communists, but none the less the charge would be true.

The railroads are a key industry in our economic system. If, through the inroads of unfair competition and losses sustained due to exhorbitant demands of the brotherhoods, they should be forced into the hands of the government, the end of free enterprise and personal liberty as it is now known would be in sight. If a majority of railway employees could be made to realize this fact, the future prospects of the railroads—and of the economy as a whole—would be much brighter. They must be so deeply impressed with the dangers inherent in the situation that they will not only act to restrain their leaders from making unreasonable demands on the railroads in their behalf, but will become more active in helping the railroads to secure equitable treatment at the hands of the government.

The matter thus resolves itself into a problem of educating the rank and file of the employees, and there is nobody better qualified for this task than the supervisory personnel, including the members of this group in the engineering and maintenance departments.

FIRE LOSSES —

Decline Reflects Benefits of Protection

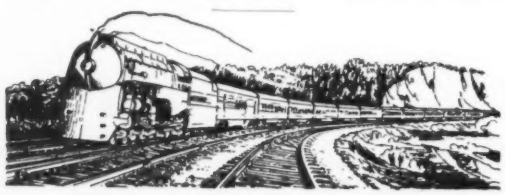
FIRE losses on railways dropped 20 per cent in 1949 and the number of fires 9 per cent, according to the Fire Protection & Insurance Section of the Association of American Railroads. However, the losses still totaled $8,740,191 and the number of fires 5,475. Almost 36 per cent of the total losses occurred to non-fire-resistant buildings and their contents, making that category rank first in losses and second in the number of fires. On the other hand only 1½ per cent of the losses, or a mere $127,308, was suffered by fire-resistant buildings.

Bridges and trestles suffered 287 fires that resulted in losses of $595,419, equal almost to 7 per cent of the total. This was $300,000 less than the loss in this category in 1948, when fewer fires occurred. Last year the greatest damage—$136,312— in this classification occurred to bridges exposed to fires from outside causes, while hot coals, sparks from brakeshoes and similar hazards caused 90 fires that resulted in losses of $101,155.

Maintenance officers must necessarily weigh these statistics in relation to their own specific problems, but to an outside observer several interpretations seem apparent. Foremost is the self-evident need for more fire protection. Great strides have been made in providing it, but last year's results show that the time to relax in such efforts hasn't yet arrived. Many techniques of protecting fixed properties from fire have been devised and others are being developed daily. These include the use of fire-resistant materials—the efficacy of which the A.A.R. report dramatically emphasizes in its comparison between the losses in resistant and non-resistant buildings—effective methods of combatting fires, improved methods of educating employees in fire prevention and the application of fire-retardant coatings to combustible portions of structures.

That these methods, to the extent they are being used, are effectively limiting the amount of fire losses, is indicated by a $76,000 reduction in the damage that occurred to bridge decks in 1949 from fires caused by hot coals and similar hazards. Several particularly effective measures have been developed to protect bridge decks from such hazards, and the effectiveness of their use appears to be manifesting itself in the statistics.

However, there can be no "resting upon the laurels" of such gains, as important as they are, for the losses are still much too high. Such losses are inversely commensurate with the degree of protection afforded railway properties. Lack of the maximum possible protection is nothing but a "bet" placed on a sure loser. Fire has repeatedly shown that it is a relentless avenger, sooner or later, of all who are negligent in protecting themselves and their properties from its ravages. Inadequate protection can only result in one or another of next year's statistics.



TIE RENEWALS —

Need for Mechanical Aids Presents a Challenge

FOR many years, maintenance officers looked forward to having at their disposal effective mechanical devices for use in making tie renewals. In view of the tremendous number of ties that are renewed annually, there hardly appears to be a more fertile field in the railroad market for manufacturers of railroad supplies than that for devices or machines that will renew ties faster and more efficiently than is possible by hand. A number of such machines are already available and others are in the development stage.

The need for such machines remained unfulfilled for so long because the design problem is not a simple one. In fact, there are so many requirements that must be considered that it is difficult to satisfy them all. For instance, the device must be able to eject an old tie but, in doing so, it should disturb the old tie bed as little as possible. Also, in placing new ties mechanically there should be little, if any, disturbance of the tie beds.

Furthermore, machines for inserting ties must grip the new tie firmly enough to force it into place but must not injure the tie surface to the extent that the preservative treatment is severely damaged. Such machines must be innately strong, durable under rough handling, and simple to operate. On the other hand, they must light enough to be easily portable. They must be safe to operate and should be quickly removable from the track.

It is because of these difficulties that the tie-renewal operation was so long in succumbing to mechanization. Now that the problem has been solved, and with additional machines about to be introduced, to what extent are the railroads prepared to capitalize on the efforts of the manufacturers? Even though satisfactory devices and machines for making tie renewals have been on the market for years their use is still somewhat limited. Perhaps the explanation in at least some cases is that, under the wage rates that prevailed a few years ago, the savings possible through the use of machines were not considered sufficient to justify their purchase.

Today, however, labor costs are quite different from those in effect a few years ago, and in addition there are fewer hours in the week in which to make tie renewals. Under the present wage rates some mechanical aids are reported to effect overall savings of as much as 50 per cent in tie-renewal costs under certain conditions. Perhaps it is in order for railroads not now using tie-renewal machines to bring up-to-date their figures on the savings possible with such equipment. There might be a surprise in store for them.

To compare the economy of different methods of renewing the involved lap-lead ladders in its Joliet yard, the Elgin, Joliet & Eastern kept time and cost records while replacing some by the conventional method and others by prefabricating them and pulling them into position. This article, which describes the manner of making these renewals and the results, was originally presented as an address before the Chicago Maintenance of Way Club.

These yard tracks were out of service for only 15 hr. because . . .

Lapping the leads of each turnout cuts the length of a ladder about in half

Preassembly

Speeds Renewal Of Lap-Lead Ladders

By S. H. SHEPLEY
Assistant Chief Engineer
Elgin, Joliet & Eastern
Joliet, Ill.

• Renewing an ordinary ladder in a busy yard is a tedious job under any circumstances, but to replace any of the 3-in-1 lap-lead ladders in our yards at Joliet, Ill.—handling 4,600 cars per day with a standing capacity of 3,500 cars—calls for even more careful planning and meticulous attention to details. To establish the most effective and economical method of doing this work, we have made time studies and cost analyses of all renewals required in the last several years. To the end that these studies would be as comprehensive and valuable as possible, we have used various systems of renewal, different gang organizations and have employed work equipment in several ways. Three of these renewal operations will be described as typical of all the work done and of the complexity of the renewal operations as a whole.

A 3-in-1 lap-lead ladder differs from an ordinary ladder by having the lead of one switch lap over the lead of the next. Thus, between the switch points and frog of the first turnout, another switch is installed leading to the second yard track. This requires, on a right-hand ladder for instance, that additional frogs be installed so that wheels on the right-hand side of a car, as the car moves onto any one of the yard tracks, can pass over the left-hand rail of the previous yard track. On our lap-lead ladders, which have No. 7 ladder frogs, these additional frogs are No. 11's and are specially designed for the purpose. The switch points of successive turnouts are approximately 40 ft. apart and the lead distance is 61 ft. 5 in.

The adoption of a 3-in-1 ladder is motivated in most instances by the necessity of saving space. Thus, in a yard containing 7 tracks at 13-ft. centers with No. 7 leads and frogs, the distance from the point of switch of the first track to the point of frog of the last track would be 605.94 ft., while on a 3-in-1 ladder, 7 tracks at 13-ft. centers would require only 310.75 ft. from the point of switch of the first track to the point of frog of the last track. The use of a 3-in-1 lap-lead ladder consequently saves 295.19 ft. of ladder distance in which to install crossovers between adjoining ladders. Although such ladders save space, they do require more material and cost more to maintain than standard yard ladders. Lack of space requires that all except one of the ladders in our East Joliet yard be of the 3-in-1 type.

When it became necessary to replace one of the smallest of these ladders in 1947, we decided to preassemble its five 3-in-1 lap turnouts out of track using new switch ties and new 112-lb. rail throughout, and to slide the entire assembly into place as a unit after the old 100-lb. ladder had been removed. Fortunately, space for assembling the new material was available ad-

Here a preassembled ladder is resting on skids waiting to be moved into place

With three bulldozers pushing on one side and a Lorain Moto-Crane pulling on the other, the ladder assembly was shifted smoothly into its approximate alinement

Shifting operations pause at the edge of the subgrade prepared for new ladder

With ladder shifted into approximate alinement, men prepare to remove skids

jacent to the ladder to be renewed.

Skid rails were installed perpendicular to the ladder and, with a 150-ton wreck crane and a 35-ton steam crane pulling on one side and two bulldozers assisted by section men pushing on the other, the ladder was slid easily into place. In fact, the shifting was done so easily that it took only 20 min. Even more important than the speed with which the actual shifting was accomplished was the short period of time—15 hr.—that the ladder and yard tracks were out of service. Had this ladder been renewed by the conventional, switch-by-switch method it would have been out of service a minimum of four 8-hr. days and two tracks would have been lost for 96 hr.

Because the preassembly method in this instance proved so effective in saving out-of-service time for the transportation department, we decided to adopt this method for renewing lap-lead ladders whereever room is available adjacent to the ladder to permit prefabrication. Since making that decision we have renewed by this method a nine-track ladder in 1948 and a seven-track ladder last fall. The methods and equipment used in the latter renewal, involving a ladder of F yard, are typical of the best techniques we have been able to devise.

Preparatory to the prefabrication work, a field party staked out the ladder approximately 35 ft. from and parallel to the in-service position. The necessary material was moved on flat cars from our material yard about ¼ mile away and unloaded at the work site. This material consisted of:

2160 ft. of 115-lb. rail
5 No. 7 115-lb. manganese frogs
6 No. 11 115-lb. manganese frogs
6 pairs of 11-ft. 115-lb. switch points
168 switch ties
Miscellaneous guard rails and switch and track material.

A foreman and 15 men assembled the ladder in five days. When the preassembly work had been completed the ladder was jacked up and skid rails were installed at about 40-ft. intervals. These rails were then thoroughly greased and the ladder lowered to rest on them.

On the date selected to start the renewal, the old ladder was taken out of service and cut up by welders. In previous instances the old ladders had been cut into 40-ft. panels which were then loaded on flat cars and deposited at a location where they could be disassembled by track forces. In this installation, however, it was decided, primarily because of a decrease in yard traffic, to take an extra day for the work and completely disassemble the old trackwork on the spot in the hope that the costs could be reduced thereby. After the material had been cut up, a Lorain Moto (truck) crane loaded some parts of it into trucks and others into gondola cars spotted in F yard.

As soon as the old track material had been removed, a Traxcavator loaded the dirt and ballast into dump trucks, leveling the subgrade as the work progressed. When this was done, the skid rails were extended across the prepared subgrade and greased, thus completing the preparations for the work of sliding the ladder into place. By adopting this method of removing the old ladder, it was possible to dispense with the services of a work train.

The next day, the Moto crane and three bulldozers were assembled at the site to move the ladder into place. A cable yoke was fastened to the center portion of the ladder and attached to the Moto crane so it could pull, while the

three bulldozers were evenly spaced behind the preassembled ladder so they could push. Section men were stationed at the ends of the ladder to give additional help as needed.

At about 9 a.m., acting in unison following a prearranged signal, the equipment and men moved the preassembled ladder into place in 35 min. This was 15 min. longer than it had taken the wreck crane, steam crane and bulldozers to move a similar ladder into place previously. The increased shifting time was caused by some of the switch ties catching on a high spot in the subgrade and by the breaking of one of the cable hitches on the Moto crane.

With the preassembled ladder pulled into approximately correct alinement, the skid rails supporting it were removed progressively. As soon as the first three switches had been lowered to the leveled subgrade, a connection was made at the beginning of the ladder and work was started on connecting its leads to the yard tracks. This work, together with the final lining of the ladder and some surfacing, was accomplished on the third day. On the following, or fourth day, the ladder was surfaced and dressed. However, after the end of the second day the ladder was open to train movements, although it was not used for switching service. Had circumstances required, the ladder could have been restored to service in one day by working overtime as had been done during previous installations. In this particular installation the requirements of the transportation department did not indicate that the additional expenditure of money required to restore the ladder to service immediately was warranted.

During the renewal, the whole ladder was out of service for 32 hr. —which includes the one day utilized to tear up the old ladder and prepare the subgrade—all seven tracks were out of service at least 40 hr., and four of them were out of service 64 hr. This is considerably in excess of the delay that was occasioned in the other preassembly jobs undertaken. However, based on our experience so far, it is reasonable to expect that, if desired, any ladder involving nine tracks or less can be renewed by this method in approximately 15 hr.

To compare this preassembly technique with the conventional method of laying one or two switches at a time, and renewing only those switch ties that do not appear to have at least three, or preferably five years' service life, we replaced a nearby ladder in G yard by the latter method. This ladder involved 7 tracks, the same as that in F-yard, and, like it, was relaid with 115-lb. material. The material used was the same as that placed in F-yard except that only 66 switch ties were renewed instead of 168. A total elapsed period of 6 days without overtime was required from the time the disassembling of the G-yard ladder was started until the surfacing work was completed.

In installing the G-yard ladder, a Lorain Moto crane was used to handle both the new and the scrap material, which was either loaded into gondolas set on the ladder, or into trucks so that it would be hauled to a point clear of the main yard and there loaded in gondola cars.

In making the installations at both F and G yards the weather was comparable, and therefore had no bearing on the costs or the progress of the work. From the time consumed in renewing the G-yard ladder it can be readily seen that the average progress was a little over one track per day restored to service. This, of course, meant that the running ladder had to be reconnected at the completion of work each night. When starting each day's work it was considered unsafe to permit service on the last track completed on the previous day because there were too many men working near it.

Thus, in using the conventional method of installation, two tracks were out of service continuously for 7 days, and five or less tracks were out of service for each 8-hr. working period, the number of out-of-service tracks diminishing each day the job progressed.

In analyzing the cost of renewing these two similar ladders by the preassembly and conventional methods, we found, much to our surprise, that it took the same number of man-hours in each case to assemble the new ladders, remove the old material, and connect the turnouts to the yard tracks. However, in the preassembled ladder, 102 more switch ties were installed than in the other ladder.

As shown in the accompanying table, the labor cost of the first three items was $378 for the preassembley method, and $312 for the conventional method. However, since 102 more switch ties were installed in the preassembled ladder than in the conventional, the average cost per turnout of installing them—$69—should be deducted to make the labor costs of the two methods comparable. Thus, the actual comparable costs were $309 per turnout for the preassembled ladder and $312 for the one installed in the conventional way. These two figures—since they represent the labor costs of renewing two ladders of the same length and number of switches at adjacent locations under similar weather conditions—afford a more comparable basis for judging the merits of the two methods than the total over-all costs per turnout, which were $622 for the preassembly method and $585 for the conventional. It should be noted that this analysis does not evaluate any savings in decreased delay to transportation operations in the yard, nor does it take into account any decreased maintenance that will undoubtedly be apparent because of the complete renewal of all the timber in the preassembled ladder.

Analysis of Cost of Two Methods

	F-Yard Preassembly Method	G-Yard Conventional Method
Assembling new ladder, removing old ladder and connecting turnouts to yard tracks (man-hours)	1261	1261
Installing and removing skid rails (man-hours)	222	----
Moving ladder into place (man-hours)	38	----
Total	1521	1261
Labor cost (above) per turnout	$378	$312
Cost per turnout installing extra switch ties	69	----
Comparable labor cost per turnout	$309	$312

These worthwhile advantages can be realized by the preassembly technique in any situation where there is enough room adjacent to the ladder to prefabricate the new switches. In fact, such a method can be used to advantage to renew ordinary No. 7, 8 or 9 ladders if additional lateral stiffness in the form of a beam of some sort is provided, or if more cranes or bulldozers are used so that the ladder can be moved into place without creating kinks in the structure.

These renewals described were made under the general direction of F. G. Campbell, chief engineer, assisted by the author and by H. M. Overpeck, roadmaster; H. R. Lane, track supervisor; E. Dickman, assistant track supervisor; A. Valek, general foreman; and S. Benus, section foreman.

Deck fires are no longer the menace they once were to open-deck trestles and open-deck bridges on the Southern Pacific—Pacific Lines. Credit for this situation is largely attributed on the road to the practice of applying fire-retardant coatings to the top surfaces of the ties and other deck timbers on these structures. Since this practice was first introduced on the Southern Pacific in 1942, it has been applied to a total of 1,419 structures, representing a deck area equivalent to that of 165,000 lin. ft. of bridge.

Above—This coating is still effective after 5 years' service. Left—Coated ties on this bridge survived a boiler explosion

Protective Coatings C

• After eight years' experience with fire-retardant coatings for the decks of open-deck bridges and trestles, consisting of applications of asbestos-impregnated asphalt covered with stone chips, the Southern Pacific can document the success of this treatment by citing a definite reduction in the number of fires occurring on bridge decks and a consequent intangible saving from unsustained losses. The whole story of that experience would contain reference to a considerable amount of visible evidence of the effectiveness of such treatment. In many other instances brake-shoe slivers and burned-out fusees have been found on bridge decks protected by fire-retardant coatings without any damage having been sustained to the timber.

Although a few fires have occurred on bridges or trestles that had previously been protected by the fire-retardant treatment, in all cases the fire started in unprotected spots, such as on those portions of long ties that extend outside the handrail—more than eight feet from the center line of track. In such cases the fire burned under the protective coating from the bottom up, but even in these instances the coating appeared to retard the spread of fire. Since the worst of these fires resulted in a loss of only $200, caused by an exploding brake-shoe, they can be classed as insignificant.

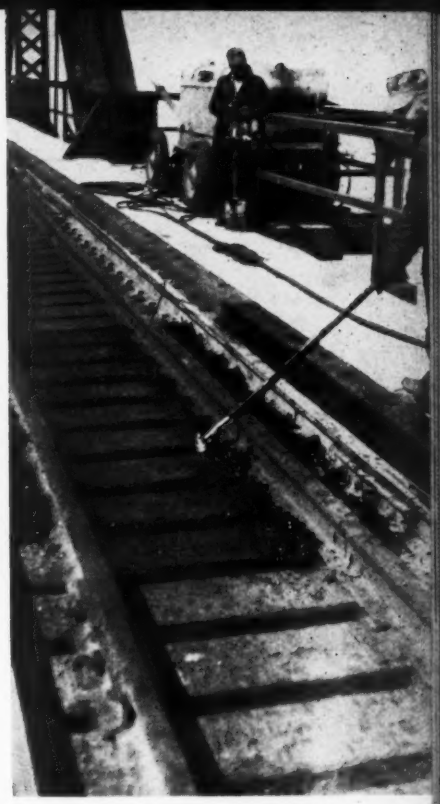
The process that has produced such effective results on the Southern Pacific consists essentially of the application of a light primer coat of asphaltic cement to the exposed timber surfaces of a bridge deck, followed by the application of a heavy-duty compound asphaltic coat that combines asbestos fiber with intensified elastic asphalt gum, after which finely crushed stone or pea gravel is applied. Enough crushed aggregate, varying from ⅛ to ¼ in. in size, is applied to cover the asphalt coat completely. As the compound coat dries it adheres to the stone, causing it to be held firmly in place. One of the characteristics of this type of treatment is a degree of resilience which permits it to stretch over cracks as they may appear in the wood surfaces and to sink into the low spots while retaining its own continuity. Thus, in addition to its fire-retardant qualities, the coating seals the wood against the absorption of moisture, thereby helping to protect it from decay.

A more detailed description of this method, and of the results obtained with early experimental installations, was published in the May, 1947, issue of *Railway Engineering and Maintenance*.

Application of the Zone method of fire protection to open-deck trestles and other bridges was first started on the Southern Pacific in 1942. Since then the method has been applied to a total of 1,419 structures, which is equivalent in deck area to 165,000 lin ft. of single-track bridge.

Coatings Applied by Spray

The original practice, when applying the Zone treatment, was to brush on both the primer and compound coats of asphaltic material by hand. At the present time, on bridges long enough to justify the use of such equipment, the asphaltic coatings are being applied by spray, using an Alemite pump. The experience has been, however, that it is not practicable to use the spray method in cold weather.



Originally both coats of asphalt were brushed on by hand (above), but in suitable weather they can be sprayed on by an Alemite pneumatic pump and spray gun (right)

ngs Cut Open-Deck Bridge Fires

On the basis of their experience with this type of fire protection for bridges and trestles, Southern Pacific engineers have introduced two slight changes in practice. Whereas it had previously been the practice to coat only that portion of the deck structure within the confines of the handrails, now all the top surfaces of flammable material are protected, no matter how far out from the track center line they may extend. On bridges where the coatings have been applied, the only change made in the construction of the bridge deck has been to raise the spacer blocks between the ties until they are flush with the tops of ties. This permits a more efficient protective coating to be applied, and also eliminates a pocket into which hot sparks and molten metal might accumulate.

Precautions Observed

Experience has shown that, to obtain the most effective results from the Zone method, a number of precautions should be observed when making the application. For example, the wood surface to which the coating is to be applied must be free of dust and dirt and must be dry. The aggregate also must be thoroughly dry and clean if it is to bond effectively to the asphalt. For this reason the use of washed aggregate is recommended. The second coat must be thick enough to permit the aggregate to be effectively embedded in it. To help accomplish this purpose an excess of aggregate should always be provided so that the compound will take up and anchor a maximum amount of the material. Although the fire-retardant coatings have been found to bond equally well on both treated and untreated surfaces, best results can be obtained on creosoted timber if it is permitted to season for a considerable length of time before application of the coating.

In common with all asphaltic materials both the primer and the top coat contain volatile solvents which are flammable. Before the asphalt dries these solvents are dissipated by evaporation and, in doing so, there is a slight possibility of their being ignited by sparks or other means. For this reason it is recommended that sand be kept available to smother any fire that may occur on the surface of the new work.

The longest bridge that has been treated by the Zone process on the Southern Pacific is the double-track Martinez – Benicia bridge–5,604 ft. long – crossing Suisun bay near Martinez, Cal. In this particular case, when ties were renewed on this 23-span structure several years ago in a rather novel manner (see the October, 1947, issue of ***Railway Engineering and Maintenance***) the deck surface, exclusive of sidewalks, was given the Zone treatment. Within the past few months the treatment has been extended to include even the sidewalks–not only where they are of wood but also where they are made of steel checkered plate. The primary reason for coating the steel walks was to prevent corrosion.

Also Used on Wood Platforms

The success of the Zone treatment on bridges has prompted Southern Pacific engineers to experiment with this material on wood warehouse platforms where hand trucking is extensive. Some of these applications have been eminently successful and others moderately so. In these experiments it has been found that for this material to be effective on warehouse floors it must be applied properly, and enough time allowed for it to dry thoroughly before permitting trucks to be operated over it.

All applications of Zone fire-retardant coatings on the Southern Pacific's bridges and trestles have been under the general direction of E. E. Mayo, chief engineer; R. W. Putnam, engineer maintenance of way and structures; and J. P. Dunnagan, engineer of bridges, all with headquarters at San Francisco, Cal.

Crossing provides a smooth surface and does not interfere with track drainage

Two men, using special lifting slings, can . . .

Open-Grating Highway Crossings

• A highway crossing which, except for timber guards on each side of the track rails, is entirely of steel construction from one approach to the other, was installed by the Erie in September, 1948, on its double-track main line at Canisteo, N. Y. Comprising a wear-in surface of steel grating this crossing is reported by the railroad to be giving satisfactory service.

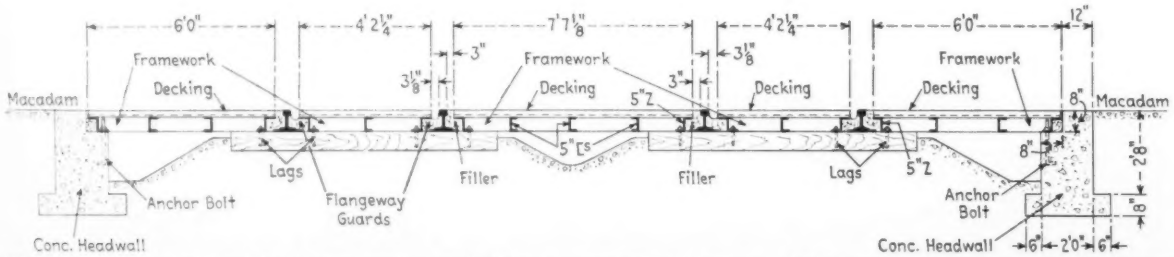
A feature of the design is that the crossing in no way interferes with normal drainage, because no part of it or its supporting frame is in contact with the ballast. Also, the grating which comprises the traveled surface of the highway is constructed in sections that can be removed readily to permit tamping the track when necessary. Further, the supporting framework may be removed to allow ballast-cleaning equipment, power tampers or other machines to work through the crossing. The cost of snow removal is reported to be minimized by the fact that much of the snow, except in the flangeways, either falls through the openings in the gratings or is forced into them.

Construction Details

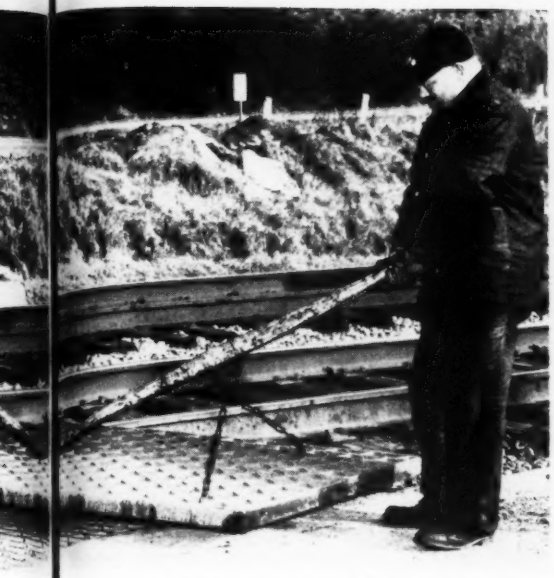
Material for the crossing was furnished by Canisteo Industries, Inc., Canisteo. It is known as the Condon steel grating crossing and is said to be adaptable to almost any crossing situation on tangent or curved track, provided the track rails and the highway approaches lie in the same, or nearly the same, plane.

The design of the crossing calls for concrete headwalls 20 in. thick, constructed across the width of the highway on each side of the track, and located 6 ft. 3 in. from the outside track rails. The tops of the headwalls are made flush with the highway surface and in the plane of the tops of the track rails. A shelf, or seat, eight inches wide is provided along the track side of each headwall to support the steel crossing sections located outside the rails. These seats are eight inches below the tops of the headwalls.

The space between each headwall and the near rail of the track is spanned by a framework made of steel Z bars and channels welded together in units 3 ft. wide and 6 ft. 3 in. long. Similar frameworks, 3 ft. wide and 4 ft. 2¼ in. long, are provided for use between the rails, while other units, in lengths depending on the distance between



This cross section of the Erie's open-grating steel highway crossing at Canisteo clearly reveals its various special features



. . . easily remove the sections of steel grating

With the grating sections removed, tie tamping becomes a simple operation

ng ls Easily Removable

A new type of steel-grating highway crossing which does not interfere with drainage, may be readily removed in sections for track-surfacing work, and, with slight additional work, may be entirely removed for the passage of ballast-cleaning equipment, has been in service on the Erie since September, 1948. In addition to these features the crossing is designed to permit the track to be raised as much as 5 in.

tracks, are used across the inter-track space, these being 3 ft. wide also. In the Canisteo installation, the inter-track units are 7 ft. 7½ in. long.

The ends of the framework units adjacent to the rails are attached to the ties by ⅞-in. by 6½-in. lag screws, while the ends which rest on the headwalls are held in place by three ⅝-in. anchor bolts. Double-coil spring washers are used with the bolts and the lag screws to compensate for vertical motion of the rails.

Modified standard flangeway and outside filler timbers are used to prevent interference with signal circuits. The filler timbers are rabbetted on the bottom and on one side so as to fit over the tie plates and rail base and assure a close fit against the web and outside face of the rail. The flangeway timbers are also rabbetted to fit close to the web of the rail, leaving an open flangeway 3⅛ in. wide. Both timbers are rabbetted on top to permit the top flanges of the Z-bar cross members at the ends of the frames to bear on the top surface, with sufficient clearance that the grating, when installed, will be flush with the top of rail or headwall.

The wearing surface is of Irving Type V decking, fabricated in sections to fit the corresponding sections of the supporting frame, to which they are attached by means of bolts. Sidewalk-type grating is used on one side of the crossing. The deck and supports are designed for H-20 loading.

The installation at Canisteo is for 131-lb. rail. By varying the depth of the Z bars and channels any rail section can be accommodated. Sheet metal plates, bent and cut to fit, were installed at the receiving end of the crossing for each track as protection against dragging equipment.

It is apparent from the accompanying illustrations that this crossing does not interfere with longitudinal drainage of the track section. When surfacing is necessary, the proper sections of decking may be removed by unbolting and lifting them out by hand and then proceeding to tamp the track. For heavier work, such as renewing ties or cleaning ballast, both the decking and the supporting frame may be removed and then replaced.

If it should become necessary to raise the track, a steel plate or timber, equal in height to the amount of the raise, can be inserted under the ends of the framework units, where they are supported on the headwalls. With such a contingency in mind, the headwall anchor bolts are made sufficiently long to allow for a total raise of as much as five inches. The surface of the highway approach can then be repaved to meet the new surface of the crossing.

The weights of the various sections of the crossing are as follows:

	Underframe	Decking
Outside of Track	311 lb.	289 lb.
Between Rails	240 lb.	200 lb.
Inter-Track Space	381 lb.	362 lb.

The installation at Canisteo was made under the general direction of Blair Blowers, chief engineer maintenance of way of the Erie, Cleveland, Ohio, and C. K. Scott, engineer maintenance of way of the Eastern district, Jersey City, N. J. R. L. Dyke, division engineer of the Susquehanna division, Hornell, N. Y., was in direct charge of the installation.

Pentachlorophenol —

Its History as a

Above—Black gum grade-crossing panels treated with pentachlorophenol. Right—A freighthouse platform on the Missouri Pacific, the deck of which was recently at least partly renewed with lumber treated with a 5-per cent solution of penta

Relatively new in the field, pentachlorophenol is widely recognized today as a useful and versatile wood perservative. This article traces the history of the compound and summarizes its important characteristics and applications, with special reference to its uses in the railroad field.

• Commercially insignificant during the first 90 years of its history, pentachlorophenol in the last 15 years has made important strides in gaining recognition in the wood-preserving field. Its preservative qualities have been thoroughly investigated through intensive testing, and today it is being widely used for the treatment of utility poles, fence posts and lumber. The chemical was accepted as a standard wood preservative by the federal government in 1947 and more recently by the American Wood-Preservers' Association in 1948.

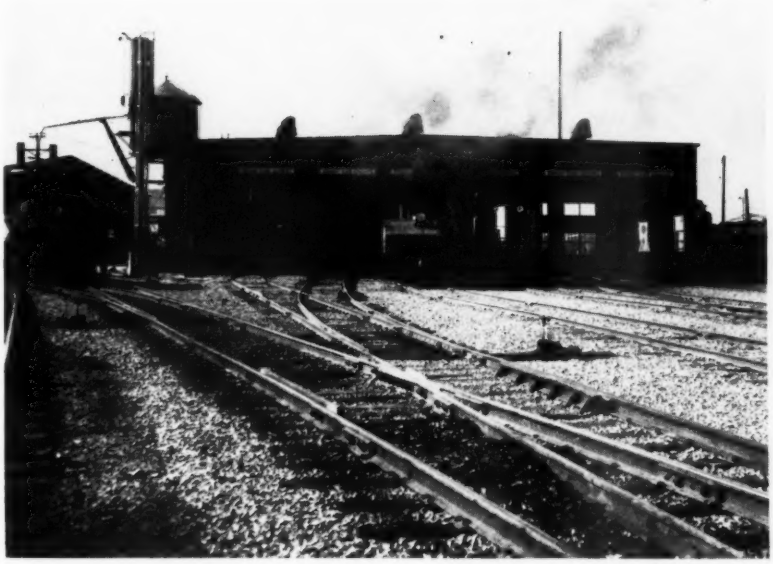
Use of the chemical in the railroad field is still largely in the experimental stage, particularly with respect to the treatment of crossties. A number of roads have made test installations of crossties treated with pentachlorophenol, including the Atchison, Topeka & Santa Fe, the Chesapeake & Ohio, the Illinois Central, the Southern Pacific, and the Texas & Pacific. A considerable number of penta-treated ties are in service in the industry tracks serving the plant of the Dow Chemical Company at Midland, Mich. Probably the oldest of these tests are two installations on the Santa Fe, one made in 1938 and the other in 1939. These consist of hewn southern pine ties treated with absorptions of 5 lb. and 8 lb. per cu. ft. of 5 per cent pentachlorophenol in gas oil. Part of these ties were inspected in 1948 and all those examined were found to be in good condition.

Versatility Chief Feature

Perhaps the most outstanding feature of pentachlorophenol as a wood preservative is its versatility. Although practically insoluble in water (it would take 7,000 gal. of water to dissolve 1 lb. of the chemical), pentachlorophenol is soluble in many types of oil. By varying the type and viscosity of the solvent, it is practical to prepare solutions suitable for treating ties, poles and lumber, and even for killing weeds. Moreover, the chemical can be applied by all the types of equipment in common usage and by all the known methods, including pressure-vacuum, hot-and-cold bath, cold soaking, dipping, brushing and spraying. Finally, since the chemical itself is colorless, any desired color of treatment may be obtained by varying the type of solvent. If, for example, a "clean" and paintable treatment is desired, it may be obtained by use of a special fuel oil as the solvent. On the other hand, if it is desirable that the wood after treatment be left with a brown color, with considerable oil retained in the wood, a heavy dark oil may be used.

Pentachlorophenol was first compounded in Germany in 1845, but apparently no thought was given to its possibilities as a wood preservative until 1929, when a representative of the Dow Chemical Company discussed with the staff of the Forest Products Laboratory, at Madison, Wis., the possibility of using chlorinated phenols in wood preservation. Since Dow at that time was producing tetrachlorophenol on a small scale, it was agreed that initial tests by the laboratory would be confined to this compound, even though it was be-

as a Wood Preservative



Left—An installation of crossties pressure treated with a solution of pentachlorophenol in petroleum oil. Above—A pole treated with pentachlorophenol

lieved that pentachlorophenol, because of its lower volatility and solubility in water, would be the better of the two.

In 1931 the Forest Products Laboratory reported that tetrachlorophenol was very effective in preventing the growth of wood-destroying and sap-stain organisms. At this time it was again suggested that pentachlorophenol be tested in addition to tetrachlorophenol, and samples of the former compound were sent by Dow to the laboratory later that year. The Monsanto Chemical Company also supplied samples of pentachlorophenol at about the same time.

During the next few years the Forest Products Laboratory investigation of the wood-preserving characteristics of pentachlorophenol was paralleled by research work at Dow Chemical aimed at producing the compound in commercial quantities. Late in 1935 test installations were made by the Dow Chemical Company and the Chapman Chemical Company at Bogalusa, La., and Jacksonville, Fla., in which 2-in. by 4-in. by 24-in. southern yellow pine sapwood specimens, pressure treated with a five-per cent solution of pentachlorophenol in several types of petroleum oil, were half buried in soil teeming with termites and decay organisms.

Late in 1936 the Forest Products Laboratory likewise started field tests of wood treated with pentachlorophenol. In these tests groups of 100 fence posts each were treated respectively with solutions containing five per cent pentachlorophenol, three per cent pentachlorophenol, five per cent tetrachlorophenol and three per cent tetrachlorophenol. These posts were installed in a test fence just being started at the Harrison Experimental Forest near Saucier, Miss.

Test installations made later of stakes treated with pentachlorophenol included one in 1938 and another in 1941, both established by the Forest Products Laboratory at Saucier. Dow Chemical also made similar installations at Bogalusa, and Jacksonville. At the present time it is reported that none of the test specimens, including those installed in 1935 and 1936, has shown signs of failure.

Meanwhile, by 1937 Dow Chemical had completed the working out of a manufacturing process for pentachlorophenol and in that year started plant production. During the war production was increased rapidly, but increasing recognition and use of the chemical by industry and the armed forces created a shortage which led to the construction of another plant shortly after the end of the war. Present capacity is considered adequate to take care of the demand for some years to come.

To date the most widely accepted process in wood preservation is the pressure method. Railroads are the largest single users of pressure-treated timber, and own some of the largest and best equipped plants for applying this treatment. In this method the treatment is conducted in steel cylinders ranging from 6 ft. to 9 ft. in diameter, closed by heavy steel doors. Pressures within the cylinders range up to 250 p. s. i.

Two types of pressure treatment are in common use—the full-cell and the empty-cell process. The former is intended to retain as much of the preservative as possible while the empty-cell process is designed to recover the solution after treatment, leaving only a coating of the preservative on the walls of the wood cells. Both of these processes have their special applications. Pentachlorophenol dissolved in suitable petroleum

oils may be applied effectively by either process.

Another type of preservative treatment by means of which "penta" may be applied is the hot-and-cold immersion process. This method involves soaking the wood in a heated solution for one or more hours, then quickly transferring it to a tank of cold solution, where it soaks long enough to absorb the desired amount of preservative. Immersion of the hot charge in the cold bath creates a slight vacuum which aids in the absorption.

Cold Soaking Gains

For applications of wood preservatives far from treating plants or where other conditions warrant, the cold-soaking process is often used. As its name implies this process consists simply of immersing the wood in a tank of preservative long enough for the wood to soak up an amount of solution sufficient to provide the desired protection. Although it has been recognized for some time, cold soaking was not considered practical until recently, when use of oil-soluble preservatives in light volatile oils has made it possible to obtain a degree of penetration without the necessity of heat or pressure.

A new vacuum process of treating wood has recently been devised that takes full advantage of low-viscosity solutions prepared with the oil-soluble preservatives. It is a variation of the pressure method that eliminates much of the expensive equipment. Though too new to be widely known, it is reported to give promise of economical treatment of some types of wood construction materials. For frame buildings and similar timber items, dipping, spraying and swabbing and other methods of applying pentachlorophenol superficially are being used to some extent. Dipping—involving immersion of the wood for three minutes in a light oil (naptha) penta solution—is used commercially on a large scale by sash and door manufacturers. This process is applicable for use on those railroads which make their own sash and other woodwork. While the methods for applying pentachlorophenol superficially are practical in many cases, it is a well-known fact that any preservative must penetrate and be retained to be completely effective.

The Safety Habit Is A Matter of Education

By J. P. DATESMAN
Engineer of Track
Chicago & North Western

• Working safely is not an inborn habit but is largely a matter of education. In the maintenance-of-way department, with its many classifications of employees, the prime responsibility for such education rests on the shoulders of the supervisors under whom the employees work. No employee maliciously performs his work in such a manner that may result in injury to himself or others. Hence, personal injuries must be the result of either carelessness, lapses of memory, unnecessary hurry, failure to watch fellow employees or, in a few cases, working with defective tools that could easily have been repaired had the foreman or employee involved been alert for defects. The elimination of personal injuries cannot be accomplished by hardboiled tactics, although it may be necessary at times to discipline employees for rule violations which might have resulted in personal injuries to themselves or to others.

Educational Program

To have a lasting effect, the process of working safely must be gradually instilled into an employee, so that he automatically sees potential accidents before they occur. While working as a roadmaster, I observed that one of the most successful ways to accomplish this and thereby reduce personal injuries was to carry out an educational program among my employees to teach them to watch each other for those occasional lapses of memory or unsafe working methods. If such educational programs are intelligently conceived and persistently pursued by the supervisor, it will not be long until the men will not only watch each other, but will not hesitate to warn a fellow worker—without causing any hard feelings—when he is working carelessly.

Safety education can consist, in many instances, merely of a few words of caution spoken informally by a supervisor, division or general officer when such officers come in contact with workers. These personal contacts between railway officers and all classes of employees under their supervision have a lasting beneficial effect on the safety consciousness of all men concerned.

Small Items Loom Large

Educating men in safety is not so much a matter of large, comprehensive safety programs as it is a continual stressing of single, seemingly insignificant actions that can be done more safely. Among such items that are small in themselves but loom large in the accident statistics as causing injuries, are lifting, the use of goggles and safety shoes, and the handling of motor cars. Many men are injured while lifting, simply because they do not know how to lift. Hernias and back injuries from such causes can be measurably reduced by a supervisor taking just a short time to teach his men to lift with their legs and not their backs. More insistent attention to the use of goggles and safety shoes will surely result in reduction of injuries to eyes and feet.

Since the working season is now in progress, with large steel or surfacing gangs actively engaged on almost every division, increased attention to safety principles on the parts of the foremen, supervisors, and division officers is essential if safety records are to be improved. The itinerant labor of which most of these gangs are composed is hard to educate because such men do not stay on the job long. Hence, foremen or assistant foremen in charge of such gangs must be alert at all times to forestall dangerous working methods. While doing this the supervisory employee cannot relax for a moment in his obligation to watch the condition of tools and all types of work equipment used by the men, to be certain to the best of his ability that they are in an entirely safe and workable condition.

An abstract of a paper read in Chicago recently at the Midwest Regional Conference of the Safety Section of the Association of American Railroads.

Diesel Steam Generators

Present Complex Water Problems

Construction features of the steam generators used in Diesel locomotives, the quality of the water required for these generators, and available methods of treatment to secure such water, are discussed in this article. It is an abstract of a paper read before the recent Midwest Power Conference, sponsored by the Illinois Institute of Technology.

By J. F. WILKES
Technical Director, Railroad Department
Dearborn Chemical Company, Chicago

Cut-away view of the compact Vapor-Clarkson steam generator which, because of its high capacity, requires a high quality of feedwater treatment

• The compact steam generators designed for railway Diesel service are novel in arrangement and constitute a complex feedwater-treatment problem. Two basic designs now are in service on American railways. The first of these is typified by the Vapor-Clarkson steam generator, manufactured by the Vapor Heating Corporation, Chicago. The second unit is the Elesco steam generator, manufactured by The Superheater Company. These units have certain features in common. Both are force-fed, forced-draft, oil-fired units, fully automatic when once placed in operation. In addition, each unit is of water-tube design and includes a steam separator from which saturated steam is delivered to the train line at controlled pressures. Normal working pressures are 250 to 265 psi.

Although both units are of water-tube construction, the location and arrangement of the steam generating tubes differ radically. The Vapor-Clarkson steam generator utilizes several hundred feet of continuous, concentric tubing, and will evaporate from 80 to 95 per cent of the applied feedwater in one pass through the coils. From a practical standpoint, this unit is almost a "flash" boiler. Dissolved solids and precipitated sludge formed in the coils by softening reactions are carried into the separator with unevaporated water droplets. Part of the concentrated water and sludge is removed from the separator by periodic blowdown. The remainder is returned through a heat exchanger to the storage system, resulting in gradual increase of feedwater mineral content, and sludge accumulation in the storage tanks.

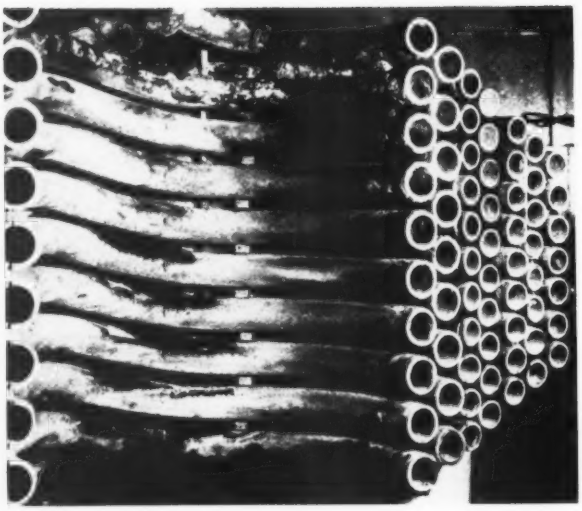
The Elesco steam generator includes both water-wall radiant sections and convection sections. This unit more nearly resembles a conventional water-tube boiler than does the Vapor-Clarkson, since several parallel steam generating circuits are provided, and water is recirculated at more than ten times the evaporation rate. Pre-heating of feedwater in the outlet header provides deaeration and accelerates softening reactions. Facilities for sludge settling and blowdown are provided. The Elesco unit does not return water from the separator to storage. Once feedwater enters the generator, it remains there until evaporated or removed by blowdown.

Water Quality Requirements

No feedwater, even though considered of satisfactory quality for steam locomotive service, is suitable for use in Diesel steam generators without special conditioning. It is essential that feedwater be properly treated to keep steam generating tubes entirely free from scale, incrustation, corrosion or pitting.

Without corrective treatment, mineral solids in feedwater either will deposit in the steam generator tubes in the form of scale, or will be precipitated as sludge. Scale or sludge deposits will reduce water flow, create excessive feed pump pressures, and may cause overheating and melted tubes. Some scale deposits resemble limestone and can be removed by circulating a corrosion-inhibited acid solution through the system. However, deposits which are predominantly calcium sulphate or silica are nearly insoluble in acid and cannot be removed in this manner. Insoluble scale deposits will cause eventual failure of coils.

Corrosion problems always exist with steam generator equipment. Feedwaters contain dissolved corrosive gases which must be removed by deaeration or neutralized by specific water-treatment chemicals. Acid conditions may be created by evaporation of untreated feedwater. Occasionally, corrosion results from faulty coil-



Showing condition of a set of coils taken from a steam generator after a test run in which it was run 20 hr. a day for 2 months. Proper feedwater treatment prevented corrosion and formation of scale

washing techniques, such as the use of raw acid without corrosion inhibitors, or failure to rinse coils and neutralize residual acid after completing coil washing operations.

The general requirements of corrective water treatment for Diesel steam generators may be summarized as follows:

1. Scaling matter in the feedwater must be converted into soluble salts, or into free-flowing, non-adhering sludge.
2. Dissolved, corrosive gases must be neutralized or removed.
3. The solvent properties of water in contact with metal at elevated temperatures and pressures must be neutralized.
4. Chemicals used must be stable at elevated temperatures and pressures, and of such nature that they will not cause incrustation of feed lines, pumps or appurtenances. They must also be suitable for application by railroad personnel.

Conditioning the Feedwater

Extensive laboratory research and road tests have been conducted in cooperation with steam- generator manufacturers and railway personnel, to develop suitable chemicals, proportioning equipment and methods for conditioning steam generator feedwater. Water-treatment methods now used on American railroads fall within two general classifications:

1. External treatment systems—feedwater is softened and conditioned prior to delivery to storage tanks on Diesel locomotives.
2. Internal treatment methods—water treating chemicals are added direct to the feedwater; softening reactions occur within the steam generating system.

Internal treatment methods for Diesel steam generators have progressed through several stages, beginning with the initial application of treatment in stick form, through small by-pass feeders (water-treatment tanks) furnished as integral components of the steam generators. Development of higher capacity steam generators has required steady improvement of chemicals and methods of application, to insure efficient operation and prevent malfunction of the complex controls with which they are equipped.

The new potassium-base treatments now available as a result of this research are versatile. They can be applied by wayside chemical feeders, added manually to water storage tanks on Diesel locomotives, or injected automatically, using solution tanks and small proportioning pumps installed on the Diesel locomotives. Potassium treatments are rapidly and completely soluble. They are designed to neutralize dissolved oxygen and scale-forming minerals rapidly, increase fluidity of sludge, solubilize or remove silica, and to coagulate suspended solids formed in softening reactions.

Although these modern steam-generator treatments are nearly universal in application, the dosages applied must be governed by characteristics of the feedwaters being treated. Based on raw-water analyses, the dosages are adjusted to neutralize all non-carbonate hardness in feedwater, and provide residual alkalinity averaging 35 to 50 per cent of total dissolved solids in concentrated boiler water.

External Treatment Methods

The internal treatment methods previously described have certain mechanical limitations and require constant supervision to function with complete efficiency. In contrast, external treatment methods can provide fully-conditioned feedwater for Diesel storage tanks, eliminating requirements for installation and maintenance of chemical-feeding equipment on the Diesel locomotives.

Due to the complex nature of the steam-generator equipment, high-quality, mineral-free feedwater such as distilled water or clean condensate is desirable. However, use of this type feedwater raises both chemical and economic problems. Distilled water and condensate are slightly acid in nature, and at boiler temperatures are highly corrosive. Corrective treatment is required to eliminate this objectionable featue. Of greater importance is the prohibitive cost of distilling large volumes of water. Further, the physical size of the distillation equipment precludes installation at many locations. Cost of producing distilled water in single-effect evaporators has been estimated at $2.00 to $8.00 per thousand gallons. Even with modern quadruple-effect evaporators, distillation costs seldom can be reduced below $1.00 per thousand gallons.

De-Ionization

Extensive ion-exchange research has made possible the de-ionization process, a modern method of mineral removal producing water chemically equal to distilled water, at a fraction of the cost of distillation. In this efficient process, mineral impurities are removed from water by chemical exchange reactions, which do not require heating or evaporation of the water.

In a two-bed de-ionizer, the water to be treated passes successively through two tanks resembling pressure filters, then through a decarbonator or degasifier. The first two tanks contain special ion-exchange materials having the unusual ability of exchanging ions, and of completely removing vari-

ous ions from solution. The exchanger resin in the first tank has a strong affinity for calcium, magnesium, sodium, iron and other metallic elements. In passing through the first tank, water loses these metallic ions and liberates remaining impurities in the form of acids. The exchange-adsorbant material in the second tank has an affinity for acids and extracts them from the water by direct contact. Carbon dioxide remaining in mineral-free water leaving the second tank is liberated and removed in the decarbonator or degasifier. As a final step, a small finishing-treatment dosage is applied to neutralize traces of residual carbon dioxide, and raise the alkalinity of finished water to the desired noncorrosive level. Quality of de-ionized water is continuously monitored by a conductivity controller which automatically stops plant operation if water quality falls below a pre-determined standard.

The ion-exchange resins in de-ionizer tanks have a fixed capacity for exchanging or removing impurities. When this exchange capacity becomes exhausted, the resins may be regenerated and their activity restored, by application of inexpensive commercial chemicals, followed by rinsing to remove residual minerals and excess regenerant solutions. The unit then is ready to be returned to service.

Field Installations

At many terminals, de-ionized water now is being supplied for Diesel cooling systems, as well as steam generators. At other locations, zeolite softening equipment, and proportioning units for application of finishing treatment, have been installed to produce scale-free, conditioned water for Diesel service. Laborers generally are assigned as plant attendants, since no special skills are required for satisfactory control of the equipment.

Nearly 60 large de-ionizing plants and zeolite units now have been installed for railway Diesel service and have shown exceptional performance. The effectiveness of this water-purification system has been demonstrated by reduction in Diesel maintenance and virtual elimination of steam-generator failures on roads where de-ionized water has been made available. Many additional units now are being installed to extend the benefits of high-quality water to other Diesel territories.

High-Cycle Electric Tool Enters Tie-Tamping Field

• After more than four years of development work and field tests, the Tarwater Railway Supply Company, Redlands, Cal., has started production of a new portable high-cycle electric tie tamper which delivers 1,800 tamping blows a minute and weighs 48 lb. It is designed for operation with any portable electric generator producing 180-cycle 230-volt current. A 2,500-watt generator will power two of the tampers and a 5,000-watt unit has sufficient capacity to operate four of them. The working area that may be covered with each tamper is limited only by the length of the cable connection between the tamper and the generator, and any desired range may be obtained through use of extension cords.

Tamper Described

The Tarwater tamper consists essentially of a barrel, 27½ in. long and 5½ in. in diameter, which houses the motor and driving mechanism, and which is provided at the top with either an offset or horizontal handle, as desired, and at the bottom with a tool holder. Reciprocal motion is imparted to the tamping tool by a roller cam action. Rotation of the motor shaft causes rotation of a roller cam follower through the medium of gears imposed between them. As the cam follower rotates it engages the surfaces of a circular cam mounted on a striker bar, thereby, in cooperation with a strong spring, causing an up and down motion of the striker bar.

Starting and stopping the tamper is controlled by a "flip of the finger" toggle switch. The tamper is provided with a lubrication seal which is said to permit safe operation for as long as 400 hr. without attention. It may be fitted with any standard tamping tool. The tool holder is provided with two cap screws which permit quick and easy mounting or removal of the tamping tools. *For more data use postcard, page 611.*

These 4 Tarwater tampers were powered by a 5,000-watt high-cycle generator

This Station Features

Modern Design,

Take the latest in building materials and architectural design, combine them with the most recent developments in decorative treatment, blend all these into the form of a railroad passenger and freight station of moderate size, adapted to the particular location—and you have the Rock Island's new station at Duncan, Okla.

Above—Large aluminum-bar "picture" windows, placed in both walls and extending to ceiling, dominate the southeast corner of the white waiting room

Right—The exterior walls of the Duncan station are constructed of cream-colored brick and are topped all around by a cut-stone coping. The canopy is edged with an aluminum store-front facia board

• The citizens of Duncan, Okla., a prosperous oil town of about 16,000 population, are enthusiastic about their new freight and passenger station, and with good reason, for the Chicago, Rock Island & Pacific has provided them with one of the most striking structures, for a city of this size, on the railroad. The station combines effectively the latest in building materials and architectural design with the most recent developments in decorative treatment, interior lighting, and other appointments. It replaces an obsolete frame structure that was inadequate for handling present-day business.

The new station, with its long dimension in the north-south direction, is located along the west side of the main tracks and is a one-story flat-roofed structure. Passenger facilities occupy the south end of the building while the remainder, in order from south to north, is given over to an office, a baggage room and a freight room. The building is 136 ft. long and 32 ft. wide except for the portion occupied by the office, which is 34 ft. wide.

The exterior walls are constructed of cream-colored brick and are topped all around by a cut-stone coping. The roof structure consists of timber sheathing supported on wood framing and is covered with tar and gravel over composition roofing. A cantilever canopy, 7 ft. wide, extends along the track side of the station from the south end of the freight room to the south end of the building and continues along the south end of the building for about half its width. The canopy is covered with built-up asphalt roofing and is edged with an aluminum store-front facia board.

Trapazoidal Waiting Rooms

The facilities for the use of passengers in the south end of the station occupy an area of 32 ft. by 37 ft. and include separate but adjacent waiting rooms for white and colored patrons. Both rooms face the same side of the office, which adds to convenience and efficiency in waiting on customers. In designing these rooms an interesting utilization of space was achieved by placing the partition between them at an angle with the outside walls instead of parallel with them, thus forming two trapazoidal areas.

The facilities for white patrons are located in the larger of these areas. The narrow end of the smaller trapazoid is partitioned into four toilet rooms, two for white patrons and two for colored, while the flaring end, facing the ticket office, serves as the waiting room for colored patrons. The white toilet

rooms are entered through doorways in the angling partition. The narrow end of the white waiting room is partly walled off by corrugated structural glass partitions to form a ticket lobby.

The primary idea behind the use of an angling partition was to keep the sizes of the toilet rooms to a minimum while providing ample space in the colored waiting room. In addition, however, the angling wall gives an appearance of spaciousness in both waiting rooms far beyond what would be expected in rooms of their size.

The walls and ceilings in the waiting rooms are of plaster and the floors are of concrete covered with patterned asphalt tile. The pleasing appearance of the white waiting room is enhanced by the fact that striped gray and green Varlar plastic wall paper was placed on the angling wall to contrast with the color scheme of the other walls of the room, which are painted a forest green. The ticket lobby is paneled with oak plywood. Lighting is provided by fluorescent fixtures recessed in the ceiling. The building is heated by gas-fired unit heaters.

Large Windows Featured

Large Geyser, aluminum-bar "picture" windows, placed in both walls and extending to the ceiling, dominate the southeast corner of the white waiting room. Facing these windows, and arranged in such a way as to form a rectangle with them, are comfortable lounge-type chairs with chartreuse-colored upholstering. Other waiting room furniture, provided also in the colored waiting room, consists of fixed individual chairs with black metal legs and arms and wood seats and backs with a natural finish.

Narrow end of the white waiting room is partly walled off by corrugated structural-glass partitions to form a ticket lobby, which is paneled with oak plywood

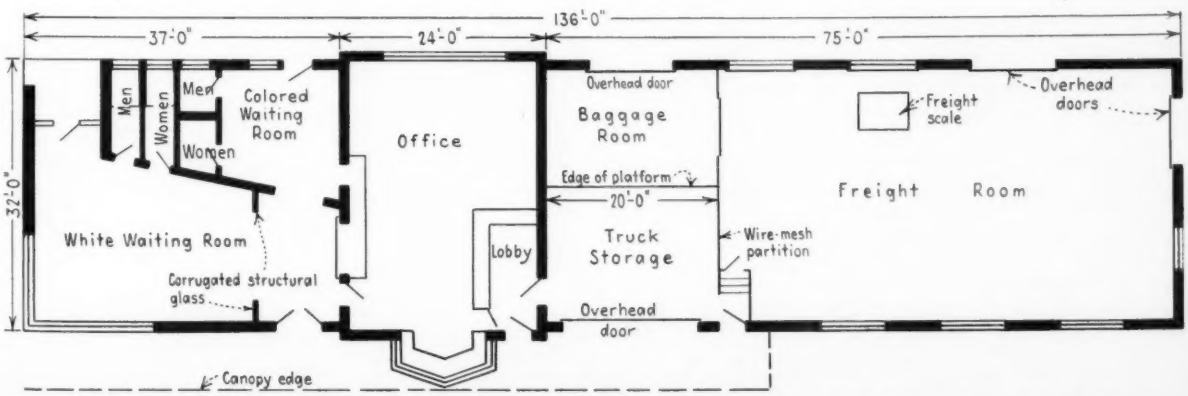
The office, 24 ft. by 34 ft. in plan, is provided with an operator's bay on the track side, a freight counter, and theater-type ticket windows on the waiting room side, with built-in ticket cases beneath the counter. The office floor is of concrete covered with asphalt tile and the ceiling is of accoustical tile.

The baggage room, 20 ft. by 32 ft. in plan, is divided into two parts. The street-side half of the room is provided with a raised concrete platform while the track-side half is a concrete-floored truck-storage area. Both the street side and the track side of the baggage room are each provided with a single overhead door.

Freight Room

The freight room, 55 ft. by 32 ft. in plan, is separated from the baggage room by a wire-mesh panel partition. It has an overhead door in the north wall and another one in the street-side wall. All window openings in the freight room are closed with glass block.

Construction of the new station at Duncan was carried out under the general direction of T. J. Engle, engineer of buildings of the Rock Island. W. C. Humphreys, architect, was responsible for the design. The station was built by Lobert and Klein, a firm of contractors at Duncan.



Plan of Duncan station. Note how use of an angling partition between waiting rooms kept down the size of the toilet rooms

After being spotted at a joint, the orifice at the bottom of each cylinder of the machine is locked over an end opening of the joint

Three turns of a hand crank forces sufficient Joint Bar Filler into the opening to lock it around the first bolt

The applicator produces a plug of trim appearance without any hand troweling

Machine Developed for Applying Rail Joint Plugs

• About two years ago, the Dearborn Chemical Company, Chicago, developed a product, known as NO-OX-ID Joint Bar Filler, for plugging the openings at the ends of joint bars where a brushed-on rail-end lubricant has been applied. As a means of applying the filler in an economical and expeditous manner the company has now devised a track-mounted machine for this purpose, which will be made available to the railroads using the material. The purpose of the joint bar filler is to seal the openings against the entrance of debris, brine, sand and water, and thus protect the brushed-on rust-preventive lubricant from weathering or abrasive action.

The joint bar filler is a plastic rust-preventive compound containing corrosion inhibitors, petroleum derivatives, and waxes with controlled melting points and penetration characteristics. Although the plasticity of this material will permit its being placed by hand with a trowel, its elasticity makes it difficult to apply the material in this manner without introducing air pockets which later may make the plugs ineffective. The machine applicator was developed to overcome this difficulty. It forces the filler material into the openings under pressure so that it penetrates about 3½ in. and keys around the first bolt, thus preventing the material from becoming dislodged or falling out. It is anticipated that the practice will be to apply the filler material at joints of new rail soon after it has been laid and before any dust and dirt have adhered to the brushed-on lubricant.

The applicator has been designed for plugging the joint openings on both the field and gage sides of a rail in one pass of the machine. Its major elements are two pressure cylinders which are mounted on one side of a steel-framed push car. In use, each cylinder is filled with the joint bar filler which, in being applied to the joints, is extruded through an orifice at the bottom by means of a hand crank and a worm-and-gear mechanism at the upper end of the cylinder. The orifices of the cylinders face each other and come in various sizes to correspond roughly to that of the openings between the joint bars and the rail. The shape of the lower ends of the cylinders is such that the orifices extend under the rail head and against the rail web.

The cylinders are so connected to each other that they can be caused to move toward or away from each other, as required by the length of the joint, and the cylinder orifices locked in place at the ends of a joint bar. By an arrangement of sliding connections and a swivel, the cylinders, after the openings on one side of a joint have been plugged, may be rotated from vertical to horizontal and then swung 180 deg. over the frame of the car for working on the other side of the rail.

Each cylinder will hold about 27 lb. of filler material which is cast in cylindrical plugs weighing 9 lb. each. Experience has shown that the forcing of about 7½ oz. of material into the opening at each end of the bar is sufficient to cause the plug to be keyed around the end bolt. This amount of material is extruded by three turns of the crank, the number of revolutions of which is controlled by a counting device to preclude wasting the material. Field tests, employing unskilled operators, show that the machine can plug about 15 joints and the cylinders refilled in approximately 40 min.

Three men can handle and operate the machine, which weighs approximately 1,200 lb. Because of the simplicity of its construction and operation, skilled help is not necessary. Removable handles at both ends of the car can be adjusted to either an inclined position for convenient pushing, or to a horizontal position for removing the car from the track. A tray is provided for carrying an extra supply of the joint bar filler. *For more data use postcard, page 611.*

Economic Repairs Of Railroad Tunnels

Side-wall failures (left) can often be repaired effectively with brick walls, such as the one shown above, which is 17 in. thick, and is backed by 2-in. by 6-in. cobbles placed at random to aid in drainage

Satisfied that many on the railroads in responsible charge of tunnel maintenance and repair do not fully appreciate, or overlook, some of the basic principles essential to the safe and economical execution of this type of work, the author has set forth in this article his understanding of these principles, based upon both his personal experience in tunnel work and his studies as chairman of an A.R.E.A. subcommittee investigating tunnel maintenance and repair practices.

By W. P. GEISER*
Former Chief Engineer
Pittsburgh & Shawmut

• The repair of faulty, leaky, or otherwise defective tunnels presents railway managements and engineers with serious structural and economic problems. The first problem is when to make repairs to preclude excessive maintenance costs, including the removal of ice from the arch and track, and the use of watchman service to insure safe train operation. Another problem—which, among the various methods available, is the proper and most effective method of repair to be used under any existing conditions. A third problem is that of how much to spend for the work, to eliminate future routine periodic maintenance, especially in the light of high present-day labor costs. One thing is certain—that it is unpardonable to spend maintenance dollars today for results that do not correct the problem encountered, results that are not at least semi-permanent in character, and work that does not reduce maintenance costs.

Studies Important

No tunnel repair program, whether it involves waterproofing or the repair of disintegrated or failed arches or sidewalls, should be undertaken before a serious study is made of the situation. Likewise, no tunnel repair job should be started without preliminary study of all available "as built" data and examination in detail of the current situation to determine the cause of the failure.

In the driving of most early tunnels, the material penetrated was seldom given primary consideration. As a result, comparatively few structures were driven through rock strata stable enough to permit the original bore to remain stable, without some form of lining to reduce maintenance or insure safety. In making the original bore in unstable or otherwise questionable material, either by head-and-bench or full-face methods, the bore was frequently timbered, and also lagged and packed, during or soon after construction. Some of the timber linings are still maintained as such, the only improvement being the use of preservative-treated timber to give longer life, or, more recently, the use of fire-retardant treatments to lessen the hazard of fire.

The two most common construction materials used in early tunnel lining were cut stone and soft brick.

*Now Representative, The Master Builders Company, Chicago

Steel liner plates can be used for both side walls and arch . . .

. . . or for the arch only in combination with brick side walls

Concrete lining, as used generally today in tunnel work, came into prominence only after the turn of the Twentieth century.

Leakage through Open Mortar Joints

Generally, the older linings of cut stone or brick, or a combination of both, have withstood the action of weathering very well, and few structural failures have occurred. Most of the trouble with such linings results from loss of mortar in the joints or disintegration of the soft brick used in the arches. At the same time, failure to provide proper or sufficient weep-hole drainage at the time of construction, a failure properly to maintain such drainage systems, has resulted in severe leakage through the open mortar joints, causing not only further disintegration of the masonry, but also unstable track conditions during periods of wet weather and critical ice conditions during periods of low temperature.

Many concrete-lined tunnels, built within the period 1905 to 1920, show excessive failure due to disintegration of the concrete. Some concrete linings have failed due to poor design, and an occasional failure has resulted from rock falls overloading the arch near the portals. Poor selection of aggregates, and often lack of cleaning and grading—particulary the sand—produced a concrete which was both porous and highly absorbent to surface water. Such concrete in the side-walls and portal faces was particularly vulnerable in low-temperature winter areas, disintegration usually starting at the ditch line or where water worked through the sidewalls or arch.

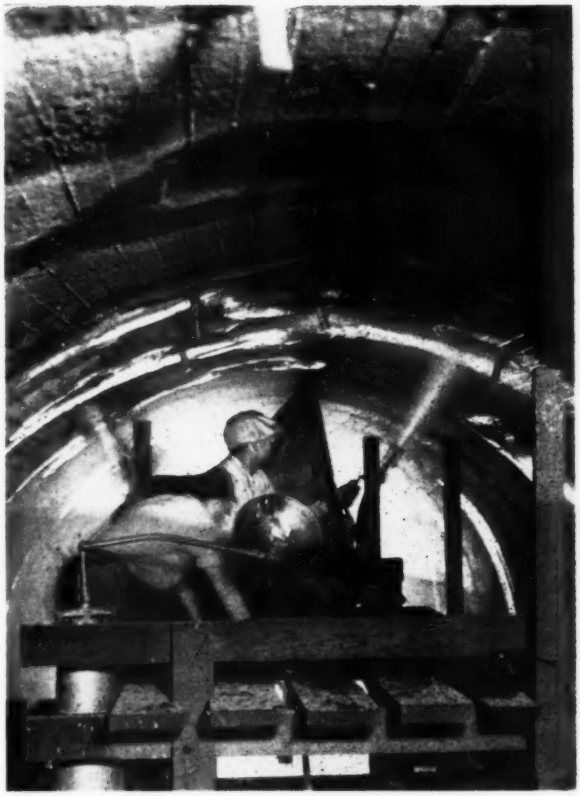
Other lining failures have resulted from failure to design and place proper support between the sidewalls and the native rock at the springing lines, or haunches. This has resulted in overloading and settling of the arch, with concurrent cracking and spreading of the sidewalls at or near the springing lines.

Present-Day Repair Methods

The popular materials and methods today for tunnel lining and lining-repair work include concrete, brick, Prepakt concrete, shotcrete, steel liner plates, steel ribs and lagging, and pressure grouting. All of these have their merits and place. The important thing to remember is to use the right material and method at the right place, which can be done only after the relative merits of each have been studied for the particular job at hand.

Every engineer has his preference of materials and methods. However, his ideas should be flexible enough so that it should not be uncommon for him, on occasion, to use several different materials and methods on the same job. It is proper and correct for railroad engineers to solicit the aid of sales engineers of the various products used in tunnel repair work, but either the railroad engineer himself, or the engineer, assisted by engineering consultants, should decide—on the basis of all the facts in each particular case—which, where and how materials should be used.

In the selection of materials, availability and total cost per unit on the job must, necessarily, be given careful consideration. Traffic density will determine the working hours on the job, and tunnel clearances will limit the size and shape of wall and arch forms, as well as the size of moving scaffolds and work cars. Unfor-



Many lining failures can be repaired effectively with shotcrete

tunately, most tunnels are already too small in cross section, and further reduction is undesirable from the standpoints of equipment clearance, reduction of train speed, and safety to train and maintenance crews.

Plant and Equipment

After the plan for repairs has been decided upon, the next important step is the selection and assembly of sufficient power tools and equipment to do the work. It is far better to have standby equipment and tools on the job than to have high-priced labor standing idle for want of them. Consideration must be given to electric power, from either commercial lines or generator units, and to ample air compressor capacity for the job. It is also very important to have adequate equipment repair and replacement parts at the location of the job at all times.

The location of the plant site is likewise an important feature, since extra handling of materials and "portal-to-portal" pay are very costly. The site should include a temporary siding near the portal for handling carload material and for clearing camp and tunnel equipment. If the cost is not excessive, it should have an access road for handling men, material and supplies by highway trucks to the job. Materials requiring protection from the weather require temporary storage buildings. Scaffold cars should be self-propelled, and sufficient motor cars should be on hand continually to handle materials into and out of the tunnel. Muck cars should be self-dumping, and the dump site so arranged that the waste material can be disposed of without rehandling. Carload materials should be handled in local freight service and work-train service held to the minimum. Temporary buildings should be available to house a field office, provide shelter and sanitary facilities for the workmen, and afford storage for valuable tools and supplies.

Working Force

The working force should be large enough to prosecute the work with dispatch, bearing in mind that the total cost of the job reflects the unit cost per cubic yard, square yard, or other unit of measure, and that any delay in placing these units, due to inadequate labor force, is costly. The most efficient gang is one wherein there is enough work to keep each man busy at the job he is hired and paid to do, rather than have him perform several different operations in any one tour of duty.

Whether or not the work is done under contract or by railroad force, a competent field engineer should be on the job all the time. He must insure smooth, efficient operation, guarantee excellent workmanship, and see that the completed work is according to plan. He must keep a complete record of the work performed for cost data purposes, and also a record of materials on hand and on order so that the job will not be delayed for lack of material, supplies, tools, etc. His field office should be equipped with a telephone for daily communication with his superior.

Safety Precautions

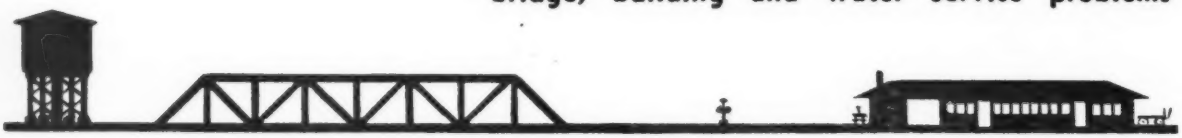
Safety on the job is of prime importance. The usual safety precautions, including hard hats, goggles, respirators, and first-aid kits, must be on hand and used. In addition, it is of prime importance that safe working conditions exist for the men. Proper flag protection, slow orders and clearing signals must be in effect. Before any work is started on sidewall or arch, they must be investigated in detail. No chance must be taken in removing material until it is known to be safe to do so. It is a lot safer, less expensive, and certainly less embarrassing, to put up temporary timber supports in bad sidewalls and temporary timber rings under bad arch conditions, before starting work, than too cause a bad fall of sidewall or arch, disturbing train operation and causing possible serious injury to workmen.

Sensible inspection of disintegrated areas, cracks in old pours at springing lines, haunches and crown of arch, and sounding of the arch material with a hand hammer, will tell the experienced field engineer whether temporary shoring is needed. It is always well to remember that heroes are usually buried, and that self-preservation is one of the first laws of nature. The surest way to avoid an accident is to recognize the situation that might bring it about and take precautionary step to prevent it.

The important things to remember in tunnel repair work are as follows: (1) There is always a cause for the failure or unsatisfactory condition; (2) survey and study must be made to determine the actual cause of failure; (3) approved methods and materials must be employed in doing the work efficiently, from the standpoint of actual cost on the job, interruption to train operation, and personal safety; (4) the work must be watched closely by experienced inspection and supervision; and (5) that the job be completed in good workmanship and design, so that the problem will not be recurrent and that the money spent in making the repairs will be reflected in future savings in maintenance.

WHAT'S THE ANSWER?

An open forum for maintenance men on track, bridge, building and water service problems



Using Grade Stakes for Raising Tracks

Should track-raising work performed with on-track type tamping machines be done to grade stakes? Where should the stakes be driven? If stakes are not used, what other methods can be employed as a guide for the raising operation?

Stakes Save Foreman's Time

By CHARLES MILLER
Assistant Roadmaster, Western Pacific, Elko, Nev.

The choice of method to be used in any operation should depend on the economy, accuracy and simplicity it lends to the work. Since grade stakes meet those requirements, all out-of-face ballast (track-raising) programs should be done with their aid. That the use of stakes results in more accurate work is apparent, but there may be a question as to whether the cost of setting them offsets the effectiveness and accuracy of the work.

When grade stakes are used, either with on-track or off-track tie-tamping equipment, there is no need for a foreman to leave whatever is getting his immediate attention and go to the head end of the job, select the spot for the next spot-board "set-up", and explain to the spot-board man how much of a raise is required at that particular place in order that a uniform grade be maintained—a chore that demands an experienced man. If the foreman does not follow this procedure, but allows an assistant, or possibly the spot-board man to do this for him, he is risking the loss of time that may be needed to go back and re-raise a portion of track left too low because of poor judgment in selecting the spot-board set-up. If he fails to correct such mistake, he is risking his reputation for leaving good track behind him. With the use of on-track, tie-tamping equipment, extra passes over any piece of track wipe out the saving of time gained by such equipment. If, however, the spot-board man—and he can be the most inexperienced man on the gang—has only to move his board ahead 100 ft., place one end of it on a pre-set grade stake, and cross-level the other, the foreman can then remain with his many other supervisory duties without worrying about the head end.

Grade stakes should be made of 2-in. by 2-in. material 48 in. long and firmly set after the subgrade shoulders have been plowed with a spreader. They should be set on the line side of the track, where possible, and be offset exactly 60 in. from the future location of the rail-head after the final line. Thus they can be used for line stakes also. There are two very good reasons for the use of this method: (1) A great saving of time and material is effected, because only one line of stakes need be driven; and (2) center stakes set along the exact center-line of the track are always in danger of being moved when skeletonizing the track. Each time a pick or shovel touches a stake it is moved slightly, and often in tie spacing work either a stake must be moved or a tie misspaced. Offset stakes do not suffer this risk, and in single-track territory, can be protected from being moved from their offset position by placing all ties, material, tools and equipment on the same side of the

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Answers to the following questions are solicited from readers. They should be addressed to the What's the Answer editor, *Railway Engineering and Maintenance*, 79 W. Monroe St., Chicago 3, and reach him at least 30 days in advance of the issue in which they are to appear. An honorarium will be given for each published answer on the basis of its substance and length. Answers will appear with or without the name and title of the author, as may be requested. The editor will also welcome any questions which you may wish to have discussed.

To be Answered In the September Issue

1. Are Diesel or steam locomotives more likely to cause driver burns? Why? What are the relative prevalence and character of driver burns caused by these types of locomotives? Explain.

2. What are some of the more effective ways of obtaining skid-resistant surfaces on masonry ramps used by passengers or employees in station buildings? Explain.

3. What is the most effective method of installing culvert pipe under new embankments to keep the pipe from disjointing? What factors contribute to such troubles? Explain.

4. What is meant by a composite deck as used on overhead highway bridges? What are its advantages and disadvantages? Under what conditions are such decks advisable? Explain.

5. To what extent are electric fences adaptable to railway use on their rights of way? What problems are involved in their use? Explain.

6. To what extent, if any, does the corrosivity of cooling water contribute to cavitation-erosion of Diesel cylinder liners? What other factors can be involved? What is the best method of control? Explain.

7. To what extent is ready-mixed concrete adaptable to railway use? What factors determine whether such concrete should be used? If used, what particular points should be covered in the specifications?

track as the stakes. This forces the men to walk on the opposite side of the track. The tools and material being used are generally moved at right angles to the track and thus do not come in contact with the stakes. During the final dressing of the ballast all stakes are removed and a clean subgrade is left to complete the job.

Use Stakes or Spot board

By Joe Greenhill

Extra Gang Foreman, Chesapeake & Ohio, Morehead, Ky.

Setting grade stakes is a tedious job and a decision as to whether they are necessary or not depends on several conditions under which the track raising is to be done. Among these are the amount of track to be raised, the location of the work and, most of all, ability of the foreman to raise track to a good grade.

If the present grade is irregular, the ballast is foul, and some spots will have to be raised more than six inches, grade stakes should be set at 50-ft. intervals on vertical curves and circular curves of six degrees or more, and 100 ft. apart elsewhere. If the track is to be raised less than six inches, the foreman should be able to "pull" a uniform grade by using a spot board. When power jacks are used, they should be equipped to carry the front block of the spot board.

When stakes are used they should be set 56½ in. from the "grade" rail so that the amount of the raise can be easily checked by setting the scale end of a track level on the rail and the other end on the stake.

Stakes Are Often Essential

By George S. Crites

Division Engineer (Retired), Baltimore & Ohio, Baltimore, Md.

Track-raising by on-track type tamping machines should be done to predetermined heights, and to accomplish this a profile must be established. If the raise is high enough to justify capitalization of the additional ballast, it is essential that levels be run to establish the top-of-rail profiles for both the old and the new rail heights. Grade stakes for such a raise are a necessity. Some prefer stakes opposite each other on each side of the track so that a straight edge can be placed on top of them. Others like top-of-rail stakes only on one side, using a level board or an off-side spot board to make the raise. In double staking, the stakes for spirals have to be precisely set from center-line stakes and the same applies to almost the same extent for simple curves.

There is less likehood of error from the use of double stakes and straight-edges than from single stakes and level boards because with the double stakes, there is less figuring and paraphernalia around the tamping machine. This is especially true on curves.

Where small lifts are made on double or multiple-track systems, leveling up from adjacent tracks can be used to advantage. On single tracks, an off-side spot-board can be used with accuracy with no interference to the machine used for the raise.

Best Guides For Raises

By N. F. Alberts

General Track Foreman, Chicago, Milwaukee, St. Paul & Pacific, Chicago

Track raising performed with on-track tamping machines or other tamping devices can be done most effectively with the aid of grade stakes. Set out by engineers, stakes are the best guides by which to bring the track to correct grade and surface.

On double or multiple-track territories the stakes should be driven in the intertrack space so as not to interfere with plowing or bulldozing the old shoulder ballast away from ends of the ties in widening the sub-shoulder to receive the new ballast. A track-raising operation usually involves light tie renewals at the time the raising is being done. The new ties can be distributed and their insertion handled from the outside of the track without disturbing the grade stakes driven between tracks.

On single track the stakes should be driven 7 ft. from the line rail and 6 ft. from the inside rail on curves. In such instances ties should be distributed and handled from the side opposite the stakes. Any plowing of the outside ballast shoulders on single track should be done in advance of tie distribution.

If grade stakes are not driven, there are a number of guides that can be used to assist in the raising operation, but none of them compare favorably with engineer's grade stakes. The foreman in charge of raising either double or single track should sight the track ahead and set his spot board about 2 in. above the rail on the high spots at intervals of every 200 ft. on tangents and about 100 ft. on curves, depending to some extent on the degree of curvature and the grade. Setting the spot board about 2 in. above the high spots will allow a running surface raise of approximately 2½ to 3 in. to be made.

Tightening Strands for Fencing

When installing woven-wire right-of-way fencing over rolling terrain, how can the individual strands be tightened uniformly? Can similar methods be used to repair sagging fences? Explain.

Can Remove Some Causes

By William Lindsey

Yard Foreman, Chicago & Illinois Midland, Pekin, Ill.

In many cases in which rolling terrain increases fence maintenance by adding to the problem of keeping the different wire strands uniformly tightened, the best thing to do is to level off the right of way. We have done so along some areas of our right-of-way fence simply by using a bulldozer and scraper. Not all of such work was done only because it lessened fence maintenance costs, but because it also gave the property a neat appearance and helped to eliminate eroded areas that in turn had increased fence upkeep. However, because all uneven terrain cannot be leveled, there still remain many miles of it to create problems in obtaining uniformly tight fences.

Woven wire has a series of tension loops or kinks on all horizontal strands. The purpose of these loops is to take care of weather expansion and contraction, and to allow a greater pull on either top or bottom strands when the fence is built over

uneven ground. Care should be taken that these loops are never completely pulled out or straightened, and that enough tension is left in them to compensate for changes in the weather.

We use a woven wire stretcher that consists of two L-shaped angle irons, 48 in. long, bolted together and clamped vertically over the wire. Two ratchet pulling jacks are attached to this clamp, one at the top and one at the bottom. These in turn are fastened by a chain to a brace post. With this arrangement pull can be exerted on one jack or both, depending on the kind of terrain over which the fence is being built, and all strands will be stretched uniformly.

The work of stapling such a fence should be done carefully to see that staples are not driven in so securely that the wire is kinked into the posts in such a way as to interfere with its contraction and expansion. The function of staples at intermediate posts is only to support the fencing vertically and transversely—not to keep it from moving longitudinally.

Sagging fence can be the result of stapling that allows for the movement of the wire in some places but not for its entire length. It could also be the result of persons climbing through the fence and breaking down the top strands, or stock being allowed to reach over or through the fence. Correct these conditions and fence maintenance problems will be minimized.

New Tightener Devised

By Robert Benbow
Benbow Fence Tightener Company, Benbow, Cal.

There is a new method for stretching fences which pulls in each wire individually. This is accomplished by a simple device, called a fence tightener, which slips into a wrench similar to a speed wrench and winds up each slack wire. This simple fence tightener remains in the fence and any additional slack may be taken up at any future time by slipping the wrench back on the tightener and giving a turn or two.

A sagging fence caused by stock mashing down the wire, or a fence loosened by thawing and softening of the ground, can be easily and quickly fixed by this same simple method.

Proper Care of Paint Brushes

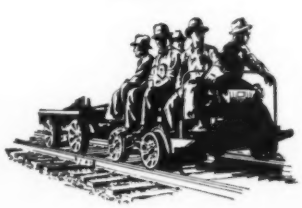
What special care should be given paint brushes to secure the best possible service from them? Should the method of care be altered depending on the type or quality of the bristles?

Clean Before Paint Dries

By Foreman Paint Gang

Some of the most practical advice that I have received on the care of brushes was recently issued by the National Lead Company through the medium of its small magazine, The Dutch Boy Painter. As I remember it, this article pointed out that the "secret" of keeping a brush in good working order is never to let paint or varnish dry in it. We all know that paint brushes made from good bristles are expensive. Hence, they can only be economical in the long run if properly broken in and properly treated while in use and after use.

The finely-ground pigments and quick-drying materials contained in many present day paints obviously tend to "gum up" bristles a lot more than was formerly the case and this fact makes brush-cleaning a somewhat tougher job than it was formerly. However, in spite of these problems, you can secure very good service from your brushes by following a few simple rules. First, in breaking a new brush in give it a preliminary 48 to 72-hr. soaking in raw linseed oil to saturate the porous bristles and prevent paint pigments or gums from becoming cemented within the bristles. For this oil bath, the bristles should be laid perfectly straight and then wrapped in wrapping paper. Just before use, unwrap the brush, wipe out the surplus oil against the side of the pail and then spin the brush over some large receptacle that will catch the oil droplets thrown off by the spinning. After the spinning, comb the bristles straight. Following this breaking-in, you'll find that, in addition to making the brush last longer, you'll have a flexible brush that is easy to use and to clean out after a job is done.



Every qualified painter should know that brushes should not be dipped into the paint clear up to the ferrule; paint will work up into the heel soon enough while brushing. These same painters, know, I am sure, that to make a brush last longer it should not be used edgewise in tight corners and recesses. Such use will cause "fingering" which, if not smoothed out, will take a permanent set and ruin the brush. In cases where it is necessary to use a wide brush edgewise, as in trimming a corner, remove the "fingering" at once with a couple of broadside strokes against the side of the paint bucket.

According to "Dutch Boy" one of the most important factors in preserving brushes is the proper cleaning at the end of each use rather than putting the job off until the paint has hardened. In doing this, two important things should be kept in mind: (1) To use the right cleaning liquid; and (2) the proper working of the paint material from the bristles. Any bristle brush can be readily cleaned, while it is still soft, with the proper thinners for the product in which it has been used. For instance: If the brush has been used in oil-base finishes or varnish, clean with turpentine, followed by mineral spirits; for shellac or alcohol stains, use denatured alcohol; for lacquer, use lacquer thinner; and for calcimine, emulsion, or water-thinned paints, clean with warm water (within one hour of use).

In cleaning a brush first remove the excess paint by wiping it off lightly on the inside of the rim of the paint can. Then press the brush, flat side down, into the proper cleaning liquid, which should be poured into a deep bucket to a depth of about two inches. This action will force the cleaning fluid well into the heel of the brush and will loosen the paint material so that it can be squeezed out easily with the fingers. With a dull putty knife, carefully scrape off all adhering paint, always working from the ferrule toward the tip of the brush. Open the bristles to expose the heel and if not clean remove the paint material with a dull knife. Repeat this operation two or three

times, dip-rinsing and spinning the brush in thinner each time to help clean out the paint material.

For stubborn cases, wash with mild soap suds and water, following with a thorough rinsing in clear water and spin to get rid of all the water. When the brush is thoroughly clean and dry, lightly comb the bristles and carefully wrap it in paper. Brushes that are to remain inactive for any length of time should be stored, laid perfectly flat, in a cool, dry place.

Building By "Modular Co-ordination"

What does the term "modular design" mean in reference to building construction? To what extent is it adaptable to railway buildings? What are its advantages and disadvantages? Explain.

Saves Labor and Material

By Arthur V. Hansen
Architectural Editor, American Builder, Chicago

One of the fundamental technical approaches to the accomplishment of cost reduction in building is through modular co-ordination—the standardization of materials on the basis of measurement.

If all building materials were made to standard sizes which are multiples of a certain number of inches, and if all architects used these standards in developing their plans, then there would be no waste of material at all, theoretically at any rate. In this concept a module is a unit of measurement. It can be any number of inches or feet, and may be applied to width, depth or height.

The idea of modular co-ordination as a method of cutting construction waste was first launched by Frederick T. Heath in 1925. It gained momentum with the development of the 4-in. modular concept by Albert F. Bemis in his third volume of "Rational Design," published in 1936, and got into full swing with the organization of Project A-62 of the American Standards Association in 1939.

Study committees representing all branches of the building industry, including architects, builders, and manufacturers, agreed after a thorough analysis that the 4-in. module was the most convenient basis for standardization of building products. This size was selected for the following reasons: (1) It is large enough for manufacturers to reduce the number of stock sizes and still satisfy consumer demand; (2) it is small enough for ample freedom in architectural design and for flexibility in equipment layout; (3) it coincides with the dimensions of a great many building materials already standardized and is applicable to present construction practices; (4) it is a unit measurement with which architects, builders, masons and carpenters are already familiar; (5) it approximates 10 centimeters (3.9 in.), the basis proposed by metric-system countries working on the same problem; and (6) standardization is prevented, since the 4-in. unit is small enough to permit entire freedom as far as design is concerned.

A number of building material manufacturers have already switched to making their products in the new size. Others, going into production of new materials, have adopted the 4-in. modular basis from the start, with the result that the idea is gradually becoming a movement.

When railway buildings are designed on the basis of the 4-in. module, grid dimensions are multiples of 4-in. and modular building materials can be fitted together in a simple and orderly manner with a reduction in cutting and waste. For instance, by modular co-ordination of windows and masonry, no extra cost in cutting bricks is necessary. From this one example it can be seen that modular co-ordination of materials and design produce less waste of materials and smaller labor expense in construction or maintenance.

Using Diesel Fuel-Oil Meters

To what extent are meters required at Diesel fuel-oil storage and servicing points? At what points in the piping system should they be placed? Explain. What characteristics should such meters possess to be satisfactory for railway service?

Meter Records Stop Losses

By W. D. Gibson
Water Service Engineer, Burlington Lines, Chicago

Meters should be used at Diesel fuel storage and servicing points to enable an accurate check of tank car receipts from the oil companies, and to record the amount of fuel dispensed to individual locomotives. The cost of Diesel fuel has risen so much that any loss can soon involve a considerable sum of money. Therefore, a complete metering system is assurance that any loss in shipping, or due to mishandling or undetected leaks, will be promptly found.

A meter should be installed at the receiving point where it can be used to measure the fuel as it is unloaded from tank cars, thus enabling the checking of the dealer's manifests. Where the unloading pump is also used for distribution of the fuel, piping can be arranged so that this meter can also be used to record the fuel dispensed to locomotives. Such an arrangement will work out to advantage if the fueling point is reasonably near the pumphouse. Otherwise, if there are multiple fueling points located some distance apart and away from the pumphouse, it is advisable, in the interest of accurate records, to have the meter or meters close to the fueling points. The matter of recording the delivery to locomotives is of importance, as it makes possible a continuous check on the cost of operating each individual unit. Diesel fuel meters should be accurate at all variable rates of flow at which locomotives may be fueled to a tolerance well within plus or minus 1 per cent.

Most meters are so designed that they may be installed without shelter, but in climates where low temperatures prevail, congealing oil may cause difficulties. Consequently, it is advisable that they be located in a shelter where heat is available.

The meters should be provided with printer attachments which

record the actual quantity dispensed to each locomotive. This attachment should be made so that it can be reset to zero and should maintain a continuous record of the total fuel dispensed, as well as the number of locomotives fueled.

For points where large quantities of oil are received, on which the basis of invoicing is at a temperature of 60 deg. F., meters with temperature compensators are available.

Locate Near Fueling Points

By B. W. DeGeer

Engineer Water Service, Great Northern, St. Paul, Minn.

Diesel fuel-oil meters are required at all fueling layouts in order to permit reliable distribution of charges for accounting purposes, locomotive fuel-oil tests etc. They measure the amount of fuel as it is delivered to the locomotive, and it is general practice to record the amount of fuel furnished to all units, rather than to keep separate records for each unit.

All meters should be located as near the fueling facilities as possible. At large terminals they may be located in shallow pits near the push-button station that controls the pump, with a small door in the pit cover to afford easy access to the meter dial. At smaller layouts, or where the pumphouse is close enough to the fueling manifold, they may be located in the pumphouse.

Our experience has been that three-inch positive-displacement type oil meters with capacities of 350 gal. per minute give satisfactory service. They are supplied with a straight reading dial with a setback feature, and also have a totalizer to 10,000,000 gal. This type of meter can also be obtained with an automatic printing register, that will print a ticket for each locomotive, and at large terminals this might be advantageous. Rugged meters that will maintain fair accuracy under all conditions are desirable for this service, and although other types may be a little more accurate than the displacement type, it is not felt that they are justified for service where correction for temperature is dispensed with. Even with the most accurate meters, adjustments must usually be made at the end of each month to cover variations.

Using Locomotive Cranes on Curves

What safety precautions should be observed in operating a locomotive crane on a superelevated curve? If necessary to swing an unloaded crane under such conditions should the boom or the counterweight be turned toward the low side of the curve?

Use on Curves with Caution

By J. J. Hite

Chief Engineer, American Hoist & Derrick Co., St. Paul, Minn.

In operating locomotive cranes, it must always be borne in mind that rated capacities are based on the machine operating on level track. It must also be remembered that there is a question of stability backward as well as the matter of forward stability.

When it becomes necessary to operate a locomotive crane on a superelevated curve, it is recommended that, to assure safe operation of the machine, all outriggers be set. The factor of safety provided in a locomotive crane for both forward and backward stability is 17 per cent; that is, this figure represents the difference between the rated capacity and the tipping load. This safety factor is lost very quickly if the two rails are not on the same level. If a load is picked up on the low side, the crane could tip forward; and, if a load is released on the high side with the boom at short radius, the crane could readily tip backward.

Depending on the particular make and model of locomotive crane, the vertical center of gravity can get as high as 7 ft. above the top of the rail, with the boom in certain positions. Assuming that the vertical center of gravity is 7 ft., then for each 1 in. rise in rail elevation, the crane safety factor would be reduced 3½ per cent. A 5-in. elevation of the outer rail would reduce the safety factor to zero.

Superelevated curves might run as high as 7 in. on the outside rail. If a crane must be operated under such conditions, and if outriggers cannot be used, then the crane can safely be used only for very light loads. In any event, the crane should not be used with the boom pointing toward the high side of the track. The sudden releasing of a load under such conditions could so easily cause the crane to tip over backword that operation would not be at all safe.

Track clamps are not recommended for use under such conditions, as they are of questionable value and their use might give the operator a false sense of security and could easily cause a serious accident.

Law Suits from Bridge Reconstruction

How serious is the possibility of damage suits being brought against railroads because of altered waterway openings at bridges during or subsequent to maintenance or construction work? What precautions should be observed and records kept to protect the railroad against such suits? Explain.

Take Every Precaution

By A. F. Crowder

Assistant Engineer, Missouri Pacific, St. Louis, Mo.

There is always a serious possibility of damage suits being brought against a railroad as a result of altered waterway openings at bridges. The conditions which usually form the basis of the damage suits result from improper investigation to determine waterway requirements, restriction of waterway area by reduction in bridge length, loss of headroom and underclearance by a change in type of construction, or failure to remove piling in old out-of-service bents, thus restricting the waterway and passage of drift through the opening.

Every precaution should be taken. A complete survey of the watershed should be made to be sure that the waterway area to be provided is adequate for any possible runoff. A record of high-water elevations above and below the

(Continued on page 662)

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track will assist in determining the waterway requirements. The opening should be large enough to avoid noticeable ponding over improved lands.

Preparedness Best Defense

By J. T. Bean
Engineer-in-Charge, Pennsylvania, Akron, Ohio

The reconstruction of a railroad bridge, whether in part or entirety, immediately arouses the interest of many individuals. This interest starts with the state boards as soon as applications are filed seeking approval of the alterations contemplated. It follows on down to the start of the work and the resultant anxiety of the land owners, both above and below the bridge site, who observe at first hand the moving in of equipment, and who lose no time in acquainting themselves with the details of the work to be done.

The possibility of an injunction immediately takes shape if it is proposed to shorten the span, build a pier where no pier exists, or in any manner tend to constrict the area of the existing waterway opening. The fact that it is proposed to compensate for areas displaced by piers, etc., by the removal of materials from the stream bed, in no way appeases the wrath of the land holder, and he proceeds to strengthen his cause by enlisting the support of his neighbors, friends and, if possible, the local authorities in preventing the construction of anything which in his mind encourages the flooding of his land.

If you manage to surmount these initial objections, you may rest assured that the first flood of any proportions that results in crop loss after the job is finished, will produce a damage suit. In one instance, formal notice was served on the railroad at the start of construction, stating that suits would follow at the first sign of damage thereafter. Such letters have no legal significance and should not deter the construction.

There are numerous precautionary measures to be taken which tend to protect the railroad in case of suit. Three of them are paramount. First, cognizant of the potential suits, no structure should be remodeled or rebuilt anywhere on a railroad, by maintenance or other forces, wherein the span is shortened or lowered, without first notifying the engineering department of the railroad of the intention to rebuild and securing the advice and recommendations of those best equipped to pass upon such matters. This procedure would develop technical facts regarding the runoff area, past flood data, theoretical waterway openings, and the procedure for notifying state agencies exercising jurisdiction over streams. It is always well, and of inestimable value, to be able to state on the witness stand that the waterway opening of the structure conforms to the requirements of the highway department of the state in which the bridge is located. That is language which the layman in the jury box can understand.

Second, a comprehensive ground survey of the bridge and bridge site should be made prior to the start of the work. The stream bed should be accurately cross-sectioned up stream and downstream from the structure, and the ground under the bridge carefully noted. This procedure should be repeated upon completion of the work. To supplement these surveys and any maps that might be prepared from them, photographs of the site should be taken prior to the start of work and again upon completion.

Third, during the progress of the work, gauge boards should be set approximately 100 ft. above and below the structure, with common zeros, so that in the event of the stream reaching flood stage during the construction period, a record can be kept of the head imposed upon the stream by temporary cofferdams, etc.

The railroad is most vulnerable to law suits during the construction period. Temporary trestles, cofferdams, etc., may well be the cause of backwater, especially if driftwood lodges against them during a high stage and creates an effective dam. In such cases in heavily wooded and headwater areas, on-track maintenance equipment should be kept available for removing heavy driftwood.

One cannot be fortified with too much pertinent data when going into court, and while it is reasonable to believe that, in rural areas, technical testimony may fall upon so-called deaf ears in the jury box, surely it does carry much weight with the trial judge in charging the jury, and if the case is appealed, also with the reviewing court.

***NEW LABORATORY FOR CEMENT AND CONCRETE RESEARCH**—Before an audience comprised of several hundred scientists and engineers dedication ceremonies took place on June 8 for a new laboratory built by the Portland Cement Association at Skokie, Ill., 16 miles northwest of downtown Chicago. This new research and development center is said to be the world's largest and most completely equipped laboratory devoted exclusively to research on cement and concrete. Comprising two buildings of architectural concrete the new research center includes more more than 30 individual laboratories, with testing equipment ranging from a million-pound compression machine to delicate instruments capable of measuring the surface area of a single grain of cement.*

PERFECT *for 4 or 8-tamper gangs*

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Pneumatractor

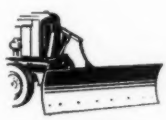
The Plus Compressor

Wherever you use air, here is your dependable, economical, and completely *mobile* supply. The *Pneumatractor's* 60 and 105-foot air capacity serves four to eight tie tampers or an adequate number of paint sprayers, sheet pile drivers, or other air tools. Its exclusive new Pneumapower motor is a marvel of compactness. And its revolutionary Pneumastat control, optional on the 60-foot model, gives you economy such as you have never known—actual *proved* fuel savings up to 50 per cent!

Yet the *Pneumatractor* is more than a compressor, more than a tractor with power take-off. Fitted with auxiliary attachments, it is a veritable fleet of mobile power machines all in one. Some of its extra uses are shown at the left; your own ingenuity will suggest others. All this means less idle time for your *Pneumatractor* and greater return on your investment.

To make an intelligent choice of a compressor or any tamping equipment, you need, for comparison, full details regarding the *Pneumatractor* Write Schramm's Railway Sales Department for your copy of Bulletin NEU-50B today.

with auxiliary equipment the *Pneumatractor* does many jobs

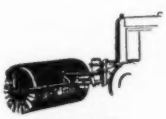

SNOW PLOW

TIE TAMPING

PNEUMAJACK

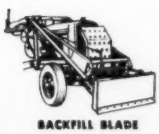
FRONT END LOADER

FRONT WINCH


ROTARY BRUSH

POST HOLE DIGGER

REAR WINCH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PRODUCTS OF MANUFACTURERS

New, improved equipment, materials, devices

(For additional information on any of the products described in these columns, use postcards, page 611)

THEW MOTO-CRANES

THE Thew Shovel Company, Lorain, Ohio, has announced two new 25-ton Moto-Cranes — the Models MC-504 and MC-504W— which were developed by modifying the Lorain 50 Series turntable and mounting it on newly-designed, three-axle, rubber-tired carriers. The two models are identical except that the MC-504W has an overall width over its rear tires of 118 in. and may be equipped with a front driving axle, if desired, while the MC-504 has a width of 102 in. and is available with power on the two rear axles only.

One of the new Thew Moto-Cranes

The turntables of these machines are each powered by a six-cylinder gasoline engine through a twin-disc hydraulic-coupling power takeoff and a multiple-strand roller-chain drive leading to the operating mechanism. The hydraulic-coupling power takeoff includes a plate-type disengaging clutch which permits stopping the mechanism for lubrication or adjustment without stopping the engine. In addition to its ability to absorb sudden shock loads, the hydraulic coupling permits raising or lowering loads at variable speeds under control of the engine throttle.

The carrier frames, designed especially for shovel and crane use, consist of deep and wide side members of internally-reinforced box sections, joined together by a front bumper, cross bracing, two outrigger boxes and a mounting plate to form a single-piece weldment. Power for the carrier is supplied by a separate 6-cylinder 220-hp. gasoline engine, which provides 10 speeds forward and two in reverse. All rear wheels are equipped with Bendix Westinghouse air brakes. Front brakes are available if desired. All models of the Moto-Crane are equipped with air-assist steering which functions automatically as the driver operates the manual steering wheel.

The crane booms for the new Moto-Cranes are of the heavy-duty type, about a third wider and a third deeper than those provided in previous models. Each boom consists of two 15-ft. all-welded sections. Center sections are available which permit extending the main boom to 100 ft. In addition 15-ft. and 30-ft. tip extensions can be furnished to extend the boom further to a maximum length of 130 ft. Also available are 19-ft. or 21-ft. shovel booms and a 19-ft. hoe boom.

RAIL FLAW DETECTOR

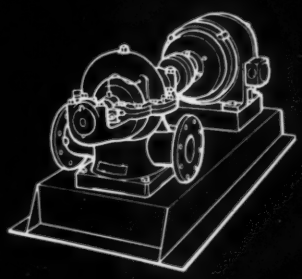
BRANSON Instruments, Inc., Stamford, Conn., announces the availability of the Audigage Flaw Detector for locating cracks across webs of rails within joint-bar limits. This flaw detector was developed in cooperation with the Pennsylvania Railroad, and after being thoroughly tested is said to have been used successfully to inspect thousands of joints.

The Audigage Flaw Detector transmits an ultra-high frequency sound wave from a small crystal vibrator into the top of a rail. When there is no defect in a rail directly under the crystal, a high-pitched signal is heard in the headphones. The presence of any defect under the crystal will result in a low-pitched signal. The instrument together with self-contained batteries weighs 11 lb. and is carried on the operator's back. No adjustment of controls is required when the instrument is in use. It is pointed out that the portability provides ease of operation and does not cause a track obstruction.

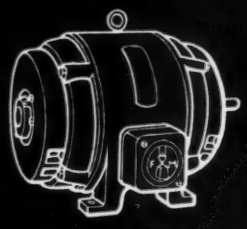
The Audigage is carried on the operator's back

It is said that experience indicates that approximately 40 joints per hour can be inspected, and that defects ½ in. or more in length

(Continued on page 666)

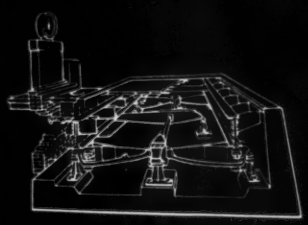


Centrifugal Pumps

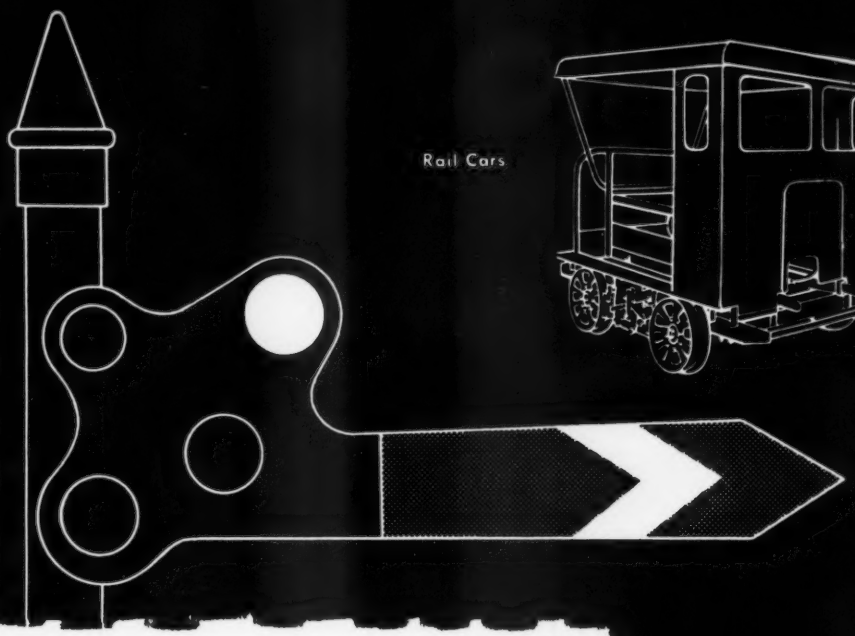


Electric Motors
and Generators

Turbine Pumps



Truck Scales



Rail Cars

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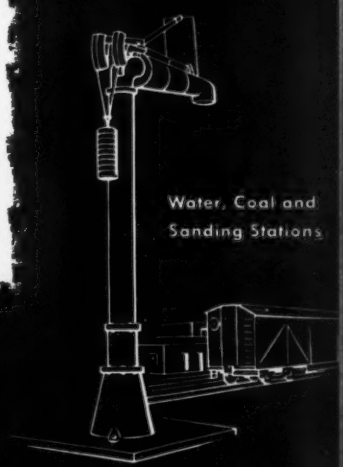
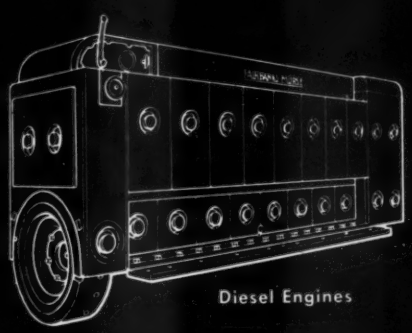
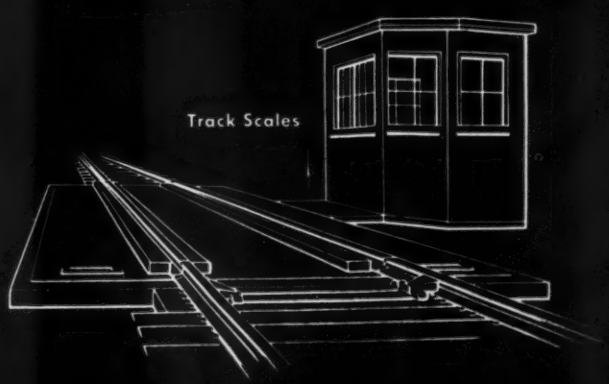


Water, Coal and
Sanding Stations



Diesel Engines



Track Scales

For additional information on any of the products described on this page, use postcards, page 611.

across the web of a rail can readily be detected. Small defects can be detected as an operator gains experience. By sliding the crystal along the top of the rail the length of a crack is determined.

BLADE-FREE PUMP FOR HANDLING TRASH

FAIRBANKS, Morse & Co., Chicago, has developed a new pump for handling trash and sewage, which is reported to be virtually clog free. It is said that practically

The pieces of cloth shown in this picture were successfully handled by the new Fairbanks, Morse bladeless trash pump

anything that will enter the inlet of the pump will pass through. This has been accomplished by substituting a helical tube channel for conventional impellor blades. Centrifugal force, produced by rotation of the channel, does the pumping work.

The curved channel tube is wound, somewhat like a corkscrew, in a helical path with increasing radius about the axis of rotation. When the tube rotates, centrifugal action throws the solids-bearing fluid against the sides of the channel. Because these follow a slanting path, the material is driven through the channel and thrown out the discharge end. The diameter of the rotating channel at its narrowest point is equal to the diameter of the inlet pipe. Because this pump is practically clog-free, it is said to require a minimum amount of attention and maintenance. It is available in sizes from 2 in. to 5 in.

The Mead "baby" bulldozer

"BABY" BULLDOZER

THE Mead Specialties Company, Chicago, has developed a small crawler bulldozer, known as "Mighty Mouse", for grading, excavating, backfilling, snow removal, etc., in close quarters or in other locations where use of the larger bulldozers is impractical or unnecessary. The unit is 60 in. long, 36 in. wide, 29 in. high, and weighs 800 lb. It is equipped with a hydraulically-operated 4½-cu. ft. combination scoop and dozer.

The machine is powered by a 5-hp air-cooled gasoline engine and has a speed range of ½ m.p.h. to 6 m.p.h., both forward and in reverse. It has a drawbar pull of 800 lb. and a scoop lifting capacity of 500 lb.

RUST-INHIBITING OIL-BASE PAINT

UNITED Laboratories, Inc., Cleveland, Ohio, is offering a new rust-inhibiting oil-base paint, known as Certified Rust Inhibitor No. 425, one application of which is said to serve, in most cases, as both a rust preventive and a finish coating. The paint may be applied to either rusted or new surfaces and to damp surfaces as well as dry. It is reported to be resistant to fumes, salt air and weather, and to withstand temperatures up to 500 deg. F. The paint is available in a choice of several different colors.

BELTED GENERATOR

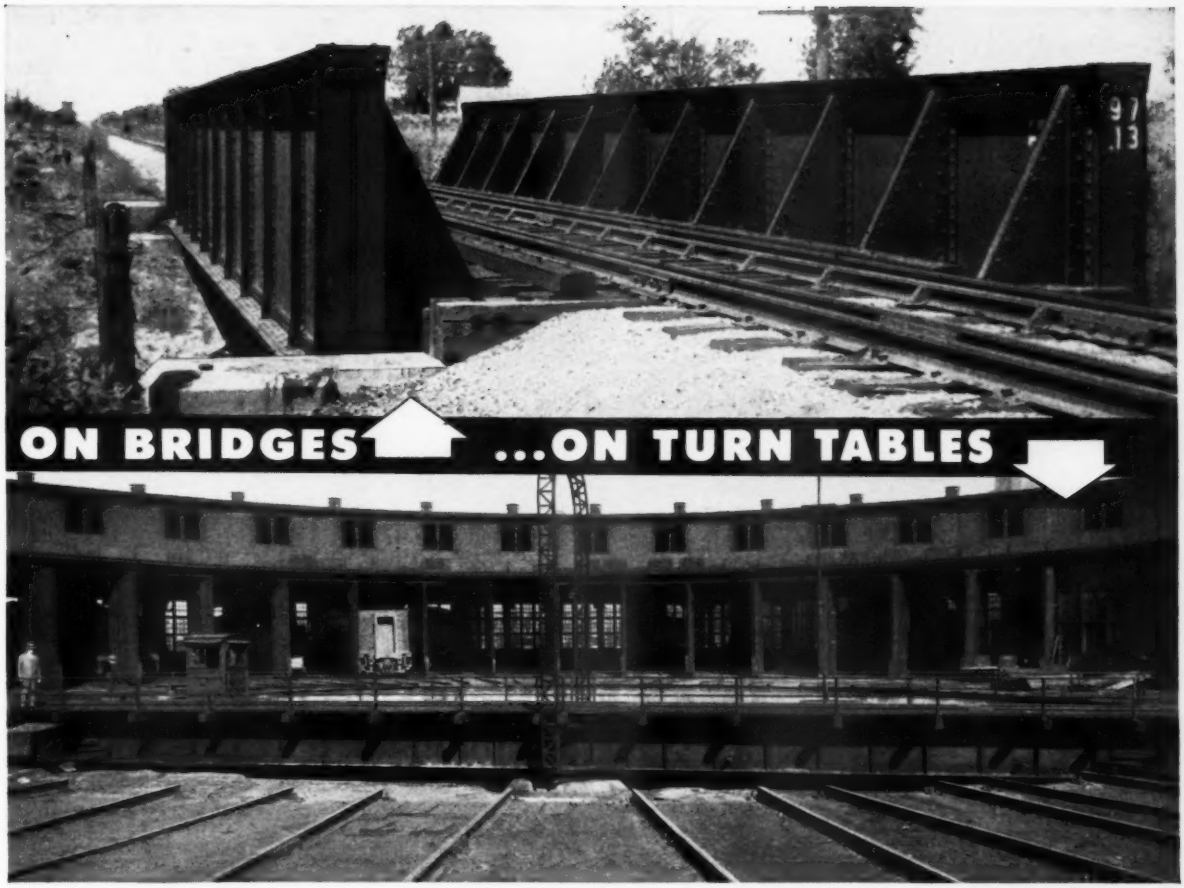
A NEW generator that can be belted to a tractor or any other available power unit whenever electric power is needed, has been announced by Fairbanks, Morse & Co., Chicago. The generator is of the four-pole, self-excited type designed to supply 60-cycle 120-volt current.

The features of the unit include armature and field-coil windings of type HF synthetic enameled wire impregnated with oven-baked insulating varnish and covered with Glyptal to make the wire completely moisture proof; screened ventila-

The Fairbanks-Morse belt-driven generator

tion openings; and a frame of drip-proof construction. The generator is available in two different capacities—3 kw. and 5 kw. The 3-kw. unit is equipped with two Twist-lock receptacles and the 5 kw. unit

(Continued on page 668)



PROTECT AGAINST RUST WITH NO-OX-ID "A SPECIAL"

In the railroad industry, rust constantly threatens . . . on bridges, turntables, track scales. To protect the surfaces of such valuable installations rely on NO-OX-ID "A Special."

NO-OX-ID "A Special" is a proved material . . . easy to apply . . . inexpensive to maintain. NO-OX-ID is particularly effective even though corrosion may be accelerated by alternately wet and dry conditions, brine, live coal, cinders or locomotive gases. NO-OX-ID prevents loss of metal and preserves the safety factor originally provided in bridge construction.

Dearborn can assist you in preventing corrosion wherever it is apt to occur. A Dearborn engineer will gladly discuss your problem.

DEARBORN CHEMICAL COMPANY
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A copy of the Dearborn booklet entitled "NO-OX-ID for Maintenance of Steel Structures in the Railroad Industry" will be sent on request.

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Please send a copy of "NO-OX-ID for Maintenance of Steel Structures in the Railroad Industry."

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THE ORIGINAL RUST PREVENTIVE

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IRON + = RUST

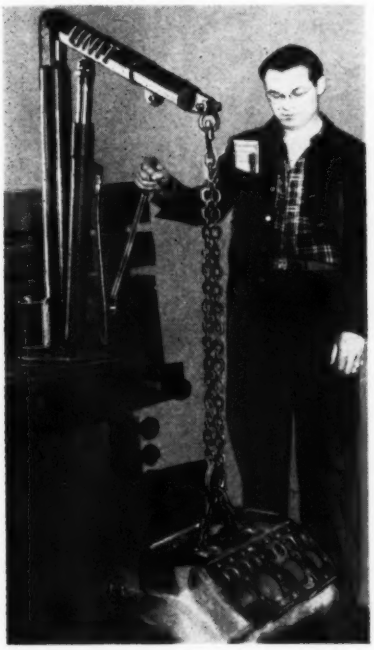
with three. Each unit is equipped with a slide rail which permits adjusting belt tension after the tractor or other power unit has been spotted in place.

UNIT UTILITY HOIST

THE Unit Manufacturing Company, Minneapolis, Minn., has developed a hydraulically-operated shop hoist which can be quickly converted to a truck hoist by lifting it from its three-wheel frame and placing it in a socket or well mounted on a truck bed. The hoist may also be mounted on a work bench or a loading platform.

Known as the Unit utility hoist, the device consists of a tubular-steel boom hinged to a tubular-steel vertical mast, and a hydraulic cylinder with a piston which raises the boom as a hand lever is pumped forward and backward. The hydraulic pump is a double-action unit which causes the boom to move upward on both the forward and backward strokes of the lever. As a load is being raised it can be stopped and held at any point.

When mounted on a truck the hoist stands 46½ in. above the truck bed. The boom is 45 in. long and has a travel of 77½ in. A lifting chain or cable can be attached to the boom at either of two points—



A Unit utility hoist mounted on the bed of a truck

one located at the extreme end of the boom and the other nearer the fulcrum of the boom. The capacities of the boom when the load is lifted at these two locations are 1500 lb. and 2000 lb., respectively.

Patent No. 2,473,941

Easily Removed for Track Work — Permits Normal Drainage

Note These Advantages

- All-steel, sectional construction.
- Permits normal drainage.
- Easily removable units.
- Facilitates tamping, ballast cleaning, snow removal, etc.
- Highly durable.
- Permits track raising to 5 in.
- Accommodates any rail section.

These new thoroughly-tested metal crossing units provide important crossing economies. Their grated, all-steel sectional construction permits ideal drainage through crossings and affords quick access to the track for surfacing operations.

These units can be quickly lifted for tamping and with little additional effort, the entire crossing can be cleared for the operation of ballast cleaning machines, power tampers, etc. Easy adjustment permits track raising to as much as 5 in. Already adopted as standard on one of the largest Class I roads.

Write for complete information.

CANISTEO INDUSTRIES, Inc.

Canisteo, New York

What Our Readers Think

MORE ON DIESELS AND RAIL DAMAGE

New York, N. Y.

TO THE EDITOR:

I read with interest the two articles in the "What's the Answer?" department of your May issue, page 470, discusssing the effect on rail damage of the increased use of Diesel locomotives. However, I believe an important point has been over-looked. It may have been overlooked because the men writing the articles were from railroads using graphite - grease curve lubrication.

While Diesel locomotives have

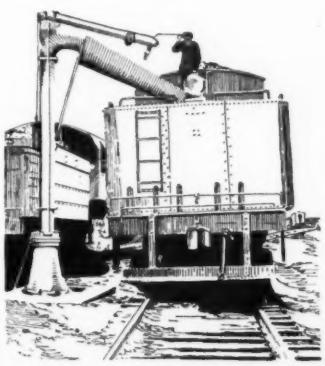
been used in increasing numbers during the last ten years, it has only been in the past few years that roads have approached 100 per cent Diesel service for road locomotives. I have been following rail and flange lubrication for 20 years. Our experience had shown us that lubrication of curves of less than 5 deg. was seldom justified by the saving in rail wear alone. On most roads practical elevation of curves would offset most of the flange thrust on the lighter curves. On roads with light traffic and lower speeds the rails would become traffic hardened before excessive flange wear occurred.

With the increased use of Diesels and elimination of steam locomotives, rail wear on curves has increased where not protected by graphite-grease lubrication. Railroads which had never been plagued by curve wear are beginning to worry. Branch lines with old traffic-hardened rail 25 to 50 years old began to show "sparklers" on the rail base, which changed to rust after rain. Sometimes the rail may have shown less flange wear than the Diesel drivers. Investigation has shown the lead drivers of Diesel locomotives received the greatest wear. It is believed that the pony trucks of steam locomotives protected these locomotives from this type of flange wear by deflecting them on the curves. The Diesel locomotives rely on their drivers to do the deflecting and consequently they receive more severe wear.

On a recent inspection, it was noted that curve flange wear caused by Diesels was as great on 3-deg. curves as was formerly noticed on 5 and 6-deg. curves in the same track when only steam locomotives were operated.

DAVID M. CLARKE
Sales Engineer
Maintenance Equipment Company

—



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Simplex Jacks at work

Working ahead of an automatic multiple tamper, light-weight Simplex aluminum alloy track jacks help speed track maintenance.

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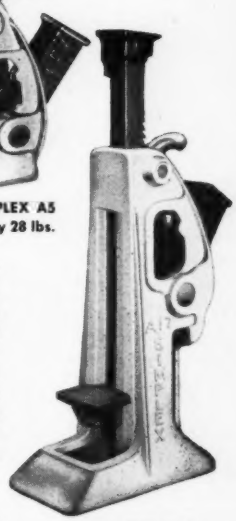
TRACK JACKS

SIMPLEX A5
Weighs only 28 lbs.



SIMPLEX A17
Weighs only 41½ lbs.

Speed of jacking, portability of jacks—with every precaution for safety of crew—are important parts of your cost-per-mile of track. Simplex Track Jacks are engineered to help you get the fastest, easiest jacking—every inch of the way. All housing sections have been increased 40% to compensate for the lesser strength of aluminum alloy. They set much more firmly and stand straighter under tie (without damage) or rail, due to the 2½" x 3¼" forged and machined toe lift. Both lift full 15 ton capacity on either cap or toe.

Simplex Jack A5 is especially suited for surfacing, lining (up to 2"), tie plate renewal, in conjunction with automatic ballast-placing or tamping machines. Simplex Jack A17 is for general-duty jacking.

SIMPLEX RAIL EXPANDERS

Avoid battered rail ends, bolts and crossings with this easy-to-use 25-ton capacity rail expander. Available also in 15 and 30 ton capacities.

SIMPLEX G-Y TIE SPACER

Saves ties from being sledged . . . reduces man hours . . . easily moves ties forward or backward into place. Made to fit any type of rail.

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THE MONTH'S NEWS

Happenings among the railways — the associations — the suppliers

Changes in Railway Personnel

General

R. P. Scott, roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Pratt, Kan., has been appointed trainmaster at Manly, Iowa.

Engineering

A. E. Smith, chainman on the Missouri-Kansas-Texas, has been promoted to assistant engineer, with headquarters at St. Louis, Mo.

J. W. Thomas, assistant to division engineer on the Seaboard Air Line, has been promoted to assistant division engineer with headquarters at Americus, Ga.

W. G. Merritt has been appointed assistant to the division engineer of the Georgia division of the Seaboard Air Line, with headquarters at Atlanta, Ga.

H. E. Chalstrom, assistant to division engineer on the Illinois Central, with headquarters at New Orleans, La., has retired after 45 years of service.

W. T. Davis, assistant office engineer on the Chesapeake & Ohio, has been appointed office engineer, with headquarters as before at Richmond, Va. He succeeds **B. W. Poulsen,** retired.

J. E. Chubb, assistant division engineer of the Columbus division of the Pennsylvania, with headquarters at Columbus, Ohio, has been appointed acting division engineer of the Toledo division, at Toledo, Ohio, to replace **J. W. Buford,** who has been granted a leave of absence.

F. A. Hunt, assistant division engineer of the Belleville division of the Canadian National, has been promoted to division engineer of the Capreol division, with headquarters at Capreol, Ont., succeeding **R. D. Aiken,** who has been transferred to the Allandale division, where he succeeds **S. McIlwain,** who has retired. Mr. Aiken's headquarters will be in Allandale, Ont.

In a recent reorganization of the engineering staff on the New York, New Haven & Hartford, **T. P. Polson,** assistant to the engineer maintenance of way, became assistant to the chief engineer, with headquarters as before at New Haven, Conn. **A. A. Cross,** engineer maintenance of way, was appointed division engineer at Hartford, Conn., where he replaced **H. K. Hislop.** Mr. Hislop was appointed contract engineer, replacing **R. L. Gallup,** who retired recently. The position of engineer maintenance of way has been abolished.

P. S. Settle, supervisor of track on the Pennsylvania, at Canton, Ohio, has been promoted to assistant division engineer, with headquarters at New York.

As a result of the consolidation of the St. Louis division and the Indianapolis division of the Pennsylvania into a new division, to be known as the Southwestern division, **H. S. Snyder,** division engineer of the former St. Louis division was appointed division engineer of the Southwestern division, and **J. P. Zearley,** division engineer of the former Indianapolis division was appointed assistant division engineer of the Southwestern division.

Elmer Lee Anderson, whose promotion to chief engineer of the St. Louis-San Francisco with headquarters at Springfield, Mo., was reported in the June issue, was born on October 20, 1888, at Hull, Ill., and received his early education at LaBelle, Mo. Mr. Anderson obtained his B. S. degree in civil engineering in 1912 from the University of Missouri College of Engineering, and for five months prior to entering railroad service he was employed by the U. S. Land Survey. He started his career with the Frisco in December, 1912, at Springfield, serving as rodman, transitman and rail inspector un-

OXWELD PRESSURE RAIL WELDS PASS 100,000 MARK—Upon completion of the rail weld shown above, by the Elgin, Joliet & Eastern on June 5, the number of welded rail joints made by the Oxweld oxyacetylene pressure method on the railroads of the United States and Canada reached the 100,000 mark. Although these welds have been made over a period of 12 years, over half of them have been made in the last three years alone. The men in the picture are, left to right: Guy Wheeler, welding foreman; L. R. Singletary, pressure-welding machine operator; F. G. Campbell, chief engineer—all E. J. & E.; Richard W. Torbert, manager, maintenance of way and construction department; and Lee Miller, pressure welding supervisor—both Oxweld Railroad Service Company.

Elmer Lee Anderson

til 1916, when he became assistant engineer. Except for the period between September, 1917, and June, 1919, when he was in the U. S. Army Engineer Corps, Mr. Anderson continued in the same capacity until his appointment as division engineer at Springfield in 1928. The following year he was again appointed assistant engineer at that point, and in 1931 was transferred to Chaffee, Mo., as roadmaster, returning to Springfield in 1937 as division engineer. From April, 1942, to May, 1947, he served as assistant to general manager, with headquarters at Springfield, and subsequently became assistant chief engineer, maintenance, there. Mr. Anderson was appointed assistant chief engineer in July, 1949, the post he held at the time of his recent promotion.

F. E. Short, whose appointment as assistant chief engineer, Western district of the St. Louis-San Francisco, with headquarters at Springfield, Mo., was reported in the June issue, was born on February 4,1904, at Mountain Grove, Mo. He attended high school in his home town and subsequently went to Drury college and the Missouri School of Mines. Mr. Short entered Frisco service in August, 1924,

F. E. Short

as a chainman on the Northern division, and after holding various positions on that division, he was advanced to assistant

(Continued on page 672)

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The New Aluminum

TRACK JACK

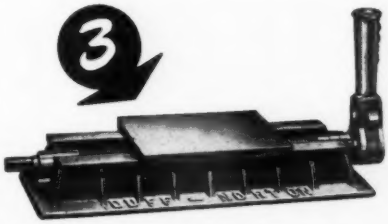
33⅓% Lighter in Weight

Designed to meet demands of maintenance crews . . . the new Duff-Norton Aluminum Track Jack is 33⅓% lighter in weight. Lighter weight, plus the new bale type handle makes the new jack easy to carry . . . easy to spot. Specify No. 117-A **Aluminum** on your next track jack order.

The Broad Toe

SURFACING JACK

The Duff-Norton 517-B, single acting Surfacing Jack features a broad toe 2½" x 3", which simplifies surfacing, lining and tamping of track. Jack features bale type handle . . . easy to carry . . . easy to spot.



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The Duff-Norton Traversing Base moves jacks horizontally while under load. Carried in pairs on wreck trains—they simplify rerailing of locomotives and cars.

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engineer on the Southwestern division in 1933. Five years later he became roadmaster on the Southern division. He was appointed division engineer, Northern and Southwestern divisions, in February, 1946, and assistant superintendent, Western division, in August, 1948. In January, 1949, Mr. Short was promoted to vice-president and general manager of the Alabama, Tennessee & Northern (now part of the Frisco) at Mobile, Ala. and in January, 1950, he became vice-president in charge of operations of the A. T. & N., the position he held prior to his recent appointment.

George Nigh, assistant engineer on the New York, Chicago & St. Louis, at Conneaut, Ohio, has been promoted to assistant division engineer, with headquarters at Frankfort, Ind. He succeeds **A. P. Milne,** whose appointment as supervisor of bridges and buildings is noted elsewhere in these columns.

Track

R. Pearman has been appointed assistant track supervisor on the Chicago & Eastern Illinois, with headquarters at Benton, Ill., succeeding **C. Reisner.**

H. F. Curtis has been appointed roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Amarillo, Tex., succeeding **W. E. Counell,** who has been granted a leave of absence because of illness.

O. M. Valde, roadmaster on the Asquith subdivision of the Canadian National at Saskatoon, Sask., recently retired after 48 years of service.

V. B. Seims, supervisor of track on the Susquehanna division of the Pennsylvania, at Northumberland, Pa., has been placed on special duty in the office of the controller, at Philadelphia, Pa. He replaces **D. A. Sutherland,** who, in turn succeeds Mr. Seims as supervisor at Northumberland.

G. H. Sims, acting general roadmaster on the Seaboard Air Line, has been appointed general roadmaster with headquarters at Raleigh, N. C. He replaces **J. D. Coe,** who returns at his own request and for reasons of health to his former position as roadmaster at Columbia, S. C.

C. C. Crenshaw, acting roadmaster at Charleston, S. C., has been appointed roadmaster of the Montgomery-Columbus district with headquarters at Montgomery, Ala., and **J. F. Martin,** roadmaster at Columbia, has been transferred to Charleston to succeed Mr. Crenshaw.

W. J. Montgomery, roadmaster on the Canadian Pacific at Winnipeg, Man., has been transferred to Emerson, Man., to succeed **C. Brynelson,** who retired June 1, after 46 years of service. **C. B. Mercer,** transitman at Winnipeg, has been promoted to succeed Mr. Montgomery. **O. O. Birkeland,** roadmaster at Kamloops, B. C., has been transferred to Winnipeg to replace **W. Cooper,** who will serve at Kenora, Ont., in the same capacity, and **J. A. MacDonald** roadmaster at Kenora, has succeeded Mr. Birkeland at Kamloops.

E. E. Gordon, roadmaster on the Bangor & Aroostook, has been appointed to the newly-created position of general roadmaster, with headquarters as before at Houlton, Me. **E. D. Ross,** section and extra gang foreman, has been appointed roadmaster of District No. 4, with headquarters at Van Buren, Me., replacing **O. G. Armstrong,** who has been transferred to Houlton to succeed Mr. Gordon on District No. 2

Mr. Gordon was born in Milo, Me., on May 8, 1900, and after a public school education entered the service of the B. & A. as a trackman in 1917. He continued in this position until 1932, when he was appointed section foreman at Brownville, Me. On September 17, 1945, he became roadmaster at Houlton and held that position until his recent promotion as general roadmaster.

Mr. Ross was born at Caribou, Me., on April 15, 1907, and was educated in the public schools there. He entered the service of the B. & A., as trackman at Caribou on December 1, 1927. He was appointed section foreman in August, 1939, but during the intervening period had temporary service as section foreman, foreman of a rail crew, a ballast gang; and other extra gangs. He remained as section foreman until his recent promotion to roadmaster.

F. J. Hajek, roadmaster on the Chicago & North Western, with headquarters at Norfolk, Neb., has been transferred to

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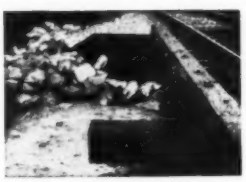

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Ironwood, Mich., succeeding **N. Malosik,** who has retired.

W. D. Norris, section foreman on the Chicago, Rock Island & Pacific, at Amarillo, Tex. has been promoted to roadmaster, with headquarters at Liberal, Kan., succeeding **H. W. Dekin,** who has been transferred to Pratt, Kan. Mr. Dekin succeeds **R. P. Scott,** whose promotion to trainmaster is noted elsewhere in these columns.

W. R. Carpenter, junior engineer on the Panhandle division of the Pennsylvania, has been promoted to assistant supervisor of track on the Lake division, at Cleveland, Ohio, succeeding **R. F. Cole,** who has been transferred to the Middle division, at Huntingdon, Pa. Mr. Cole replaces **W. S. Titlow,** who has been promoted to supervisor of track at Kalamazoo, Mich., where he replaces **William Glavin.** Mr. Glavin, in turn replaces **A. B. Baker,** whose appointment as supervisor of the wood preserving plant at Mt. Union, Pa., is announced elsewhere in this issue. **D. W. Warfel,** junior engineer on the Columbus division, has been promoted to assistant supervisor of track on the Philadelphia division, at Enola, Pa., succeeding **C. L. Armentrout,** who has been transferred to Lewistown, Pa. Mr. Armentrout replaces **L. D. Freeman,** who has been promoted to supervisor of track on the Panhandle division, at Carnegie, Pa. Mr. Freeman, in turn, replaces **N. J. Padula,** who has been transferred to Homestead, Pa., where he succeeds **W. R. Catching.** Mr. Catching has been transferred to the Eastern division at Canton, Ohio, to replace **P. S. Settle,** whose promotion to assistant division engineer is reported elsewhere in this issue.

Bridge and Building

James T. Hill, supervisor of bridges and buildings on the Peoria & Eastern, with headquarters at Urbana, Ill., retired recently.

Robert W. Orr has been appointed supervisor of bridges and buildings on the New York Central, with headquarters at Corning, Ohio, succeeding **E. M. McCullough,** deceased.

R. W. Cassidy, assistant supervisor of bridges and buildings on the Chesapeake & Ohio, at Richmond, Va., has been appointed supervisor of bridges and buildings of the Chicago division, with headquarters at Peru, Ind. He succeeds **C. F. Gilbert,** who has retired.

A. P. Milne, assistant division engineer on the Clover Leaf district of the New York, Chicago & St. Louis, has been promoted to supervisor of bridges and buildings, with headquarters as before at Frankfort, Ind. He succeeds **H. F. Turnbull,** who has retired after 47 years of service.

C. D. Howell, master carpenter of the former Indianapolis division of the Pennsylvania, has been appointed master carpenter of the recently consolidated St. Louis and Indianapolis divisions, known as the Southwestern division. **H. A. Campbell,** master carpenter of the former St. Louis division, has been appointed assistant master carpenter on the new division.

Water Service

R. M. Stimmel, superintendent of water service of the New York, Chicago & St. Louis, has been appointed engineer of tests and water service, with headquarters as before at Lima, Ohio.

Special

A. B. Baker has been appointed supervisor of the wood preserving plant of the Pennsylvania at Mt. Union, Pa., to succeed **G. W. Chilcoat,** who will retire on August 15.

Obituary

Steve Kozak, roadmaster on the Canadian Pacific at Princeton, B. C., died recently.

Hugh B. Holmes, who retired in 1943 as chief engineer of the Georgia & Florida, at Augusta, Ga., died in that city on June 1.

George D. Baird, bridge and building master of the Revelstoke divison of the Canadian Pacific, and **John T. Cameron,** retired roadmaster, Preston, Ont., died recently, both at the age of 64. **Patrick Coakley,** also a retired roadmaster, died recently at the age of 86.

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It happened all in one day. On a rail-laying job, MICHIGAN set in as many rails as the gang could lay, gage and fasten. Then it travelled five miles to unload a car of cinders.

Result? MICHIGAN'S exceptional mobility increased productive time of crane and operator . . . released a steel gondola for revenue service . . . reduced per diem payments on a foreign car!

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Association News

American Railway Engineering Association

Only one standing committee has scheduled a meeting to be held in July. This is the Committee on Iron and Steel Structures which will meet at the Mount Royal Hotel, Montreal, Que., on July 19 and 20. To date, the only committee that has scheduled a meeting to be held in August is that on Water Service and Sanitation which will meet at the association's headquarters in Chicago on August 8.

The Proceedings for the 1950 convention are now in the hands of the bindery, and it is expected that they will be mailed to members during the first week in August. The June-July Bulletin will be mailed to members about the middle of July. This Bulletin will contain three important features, namely, a report giving the result of impact tests on three girder bridges on the Chicago & North Western, prepared for the committee on Impact and Bridge Stresses by the research staff of the A.A.R., under the direction of E. J. Ruble, structural engineer; a synopsis of the report on lateral forces exerted by locomotives on curved track on the Atchison, Topeka & Santa Fe, prepared by the A.A.R. Joint Committee on Relation Between Track and Equipment; and a statistical report on tie renewals of the Class I railroads for 1949, prepared by the Bureau of Railway Economics of the A.A.R.

Roadmasters' Association

The Program committee, under the chairmanship of F. G. Campbell, chief engineer, Elgin, Joliet & Eastern, has been working on the program for the annual convention to be held at the Stevens Hotel, Chicago, on September 18-20, and a tentative outline of activities has been drawn up which gives promise of resulting in an unusually interesting and constructive meeting. Also for the purpose of furthering plans for the convention is a meeting of the Executive committee that is scheduled to be held at the Engineers' Club, Chicago, on July 10. The principal objective of this meeting is to review the preliminary reports of the technical committees to assure that they will be in good shape for presenta-

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Meetings and Conventions

American Railway Bridge and Building Association—Annual meeting, September 18-20, 1950, Hotel Stevens, Chicago. Elise LaChance, Secretary, 431 S. Dearborn Street, Chicago 5.

American Railway Engineering Association—Annual Meeting, March 13-15, 1951, Chicago. Neal D. Howard, Secretary, 59 E. Van Buren street, Chicago 5.

American Wood-Preservers' Association—H. L. Dawson, Secretary-treasurer, 839 Seventeenth Street, N. W., Washington 6, D. C.

Bridge and Building Supply Men's Association—E. C. Gunther, Secretary, 122 S. Michigan Avenue, Chicago 3.

Maintenance of Way Club of Chicago—E. C. Patterson, Secretary-treasurer, Room 1512, 400 W. Madison street, Chicago 6.

Metropolitan Maintenance of Way Club—Walter L. Turner, Jr., Secretary, 30 Church street, New York.

National Railway Appliance Association—R. B. Fisher, Secretary; Lewis Thomas, assistant, Secretary 59 E. Van Buren street, Chicago 5.

Railway Tie Association—Annual meeting, August 28-30, 1950, Brown Hotel, Louisville, Ky., Roy M. Edmonds, Secretary-treasurer, 610 Shell Building, St. Louis 3, Mo.

Roadmasters' and Maintenance of Way Association of America—Annual meeting, September 18-20, 1950, Hotel Stevens, Chicago. Elise LaChance, Secretary, 431 S. Dearborn street, Chicago 5.

Track Supply Association—Lewis Thomas, Secretary, 59 E. Van Buren street, Chicago, 5.

tion at the convention. As in recent years the annual meeting will be held concurrently with that of the American Railway Bridge & Building Association.

Track Supply Association; B.&B. Supply Men's Association

Duing June a total of eight additional manufacturers signed up for space in the joint exhibit that is to be held by these two associations during the concurrent annual conventions of the Roadmasters' Association and the American Railway Bridge & Building Association, to be held at Chicago, September 18-20. This means that, at the time of going to press, 111 manufacturers were planning to participate in the exhibit. These companies will occupy a total of 241 booths. The companies that have signed for space since the complete list was published in the June issue are as follows:

Allis Chalmers Manufacturing Company, Tractor Division, Milwaukee, Wis.

Aluminum Company of America, Pittsburgh, Pa.

Briggs & Stratton Corporation, Milwaukee, Wis.

Motorola, Inc., Chicago

Morrison Railway Supply Corporation, Buffalo, N. Y.

Murdock Mfg. & Supply Co., Cincinnati, Ohio

Lyle Signs, Inc., Minneapolis, Minn.

The Zone Company, Ft. Worth, Tex.

Of the 263 booths available in the Coliseum, only 22 remain to be accounted for. Additional companies wishing to participate in the exhibit should address their requests to Lewis Thomas, Director of Exhibits, 59 E. Van Buren St., Chicago.

Bridge and Building Association

Plans for the annual convention, to be held at the Hotel Stevens, Chicago, September 18-20, concurrently with that of the Roadmasters' Association, are rapidly taking shape. The basis for an interesting program of activites has been laid by the Program committee, and a meeting of the Executive committee is to be held at the Engineers' Club, Chicago, on July 17 to consider this tentative program and to review the preliminary reports of the technical committees. In a general way the program will follow the pattern of recent years, except that a number of new "wrinkles" will be introduced, which are expected to add to its interest and effectiveness.

Supply Trade News

General

D. W. Onan & Sons has appointed the **T. C. Johnson Company** as its railroad representative in the Cleveland (Ohio) area.

The completion of new research facilities has been announced by Robert P. McCulloch, president of the **McCulloch Motors Corporation.** Part of an expansion program, the new building is located next to the main plant at Los Angeles, Cal., and embodies the same clean-cut functional design. In it will be conducted research work leading to the improvement of this company's line of chain saws, pumps and other engine-powered equipment.

Gar Wood Industries, Inc., has announced the purchase of the National Truck Equipment Company, Waukesha, Wis., which property will be operated by a newly-formed and wholly-owned subsidiary of Gar Wood, to be known as the **National Lift Company.** This acquisition adds to the established line of Gar

BALLAST IS SCREENED BY CONTRACT — ELIMINATING INVESTMENT BY RAILROADS IN THIS ONE OPERATION EQUIPMENT . . .

Stone ballast cleaned by the Speno method is thoroughly cleaned because it is screened twice. In order to obtain a thorough cleaning, two passes are necessary to restore the ballast to as clean a condition as when it was originally placed in the track. The two passes are accomplished in less time than a single pass by other mechanical methods.

Preferably, the ballast is cleaned ahead of a general track raise, and under the Speno method, no cribbing is necessary. Because of the drainage that the Speno method attains, the cleaning lasts from one general raise until it is time for another general raise, normally over a period of from three to six years, depending on conditions.

Speno equipment, working under traffic without interference with railroad operation, (the track adjacent to the one being worked is not fouled by our equipment in working position) easily keeps ahead of track raising programs.

The high production and low cost of this service are worthy of consideration.

FRANK SPENO RAILROAD BALLAST CLEANING CO. INC.

306 North Cayuga Street Ithaca, New York

Supply Trade News (Cont'd)

Wood and St. Paul dump bodies, hoists and refuse-collection bodies, and Gar Wood winches, cranes, and pole derricks, the following products: The Dump-O-Matic twin hydraulic hoist for ½, ¾ and 1-ton trucks, the Hydra-Clutch pump—a fan-belt driven hydraulic pump with self-contained clutch—and the Jumbo twin hydraulic hoist for 1½ and 2-ton trucks.

The **Industrial Brownhoist Corporation,** Bay City, Mich., has announced the opening of a new sales office in Pittsburgh, Pa. The office is located at 1422 Oliver building and is under the direction of J. A. Peppard, district manager of the Pittsburgh-Cleveland territory.

The **Blackmer Pump Company** has appointed the following organizations as distributors of the entire Blackmer line of products and service parts: The **Blott-Robb Company,** the **Transmission Machinery Corporation,** and the **Amco Corporation,** all in Chicago; the **H. O. Link Company,** Baltimore, Md.; the **Tri-State Equipment Company,** Kansas City, Mo.; and the **Avels Sales & Engineering Co.,** Indianapolis, Ind.

The **Chattanooga Welding & Machine Co.,** Chattanooga, Tenn., has been licensed by **Railway Ballast Engineers, Inc.,** to manufacture and sell its ballast-cleaning machine which is known as the Ballastmaster. **S. F. Judd,** president, Railway Ballast Engineers, Inc., has been appointed manager of the Railway Equipment division, Chattanooga Welding & Machine Co., with headquarters at Chattanooga.

Personal

R. P. Eninger, formerly domestic sales manager of the **Wayne Pump Company,** has been appointed manager of the air compressor division.

Charles Wilkie has joined the sales engineering staff of the **Sika Chemical Corporation.** He will have headquarters in Passaic, N. J.

Raymond L. Howerton is now in charge of tractor-equipment promotion for the **Hyster Company,** according to a recent announcement from Phil Hill, general sales manager.

Effective August 1, **Dr. Kent R. Van Horn,** assistant director of research of the **Aluminum Company of America,** will become associate director of research, with headquarters at New Kensington, Pa.

The **Timken Roller Bearing Company** has announced the appointment of **Glenn E. Neal** as sales engineer, Railway division, with headquarters at Chicago, succeeding **J. W. Thomas,** who has been transferred to St. Lous, Mo.

C. V. Travis, has been appointed Eastern Division sales manager of the **Blackmer Pump Company,** with headquarters in New York. **John X. Hogan** has been appointed sales representative of the company in Washington, D. C.

Roy F. Johnson has been appointed manager of the Sales and Service Engineering division of the **Pullman-Standard Car Manufacturing Company,** Chicago.

Roy F. Johnson

In his new position Mr. Johnson will serve as liaison for the sales department with the shops, production engineering department, and the research department. He will also direct the customer field service heretofore conducted by the research department.

L. J. Lange has been appointed industrial power product specialist of the **International Harvester Company,** Chicago, succeeding **S. L. Siegfried.** In his new position Mr. Lange will be concerned with the design and sale of industrial wheel and crawler tractors, and power units.

The **Black & Decker Manufacturing Co.** has announced the following personnel changes in its field sales force and service organization: **Robert A. Brown,** service engineer at the Cincinnati (Ohio) factory service station has been promoted to sales engineer in the Atlanta (Ga.) branch territory. He is succeeded at Cincinnati by **George H. Thalman, Jr. W. F. Dunn, Jr.,** service engineer at the New Orleans (La.) branch, has been promoted to sales engineer in this territory. **Grady R. Funk,** service engineer at Charlotte, N. C., has been transferred to New Orleans to fill Mr. Dunn's former position.

George E. Shafer, manager of the sales engineering department of **Armco Drainage & Metal Products, Inc., Armco Steel Corporation** subsidiary, has been appointed chief engineer. In his new post, Mr. Shafer continues in charge of the sales engineering department, and in addition, assumes responsibility for the product engineering and new-product development departments. This change was occasioned by the retirement of **Carleton C. Clark,** manager of the fabricated products engineering department, and **John R. Wilks,** manager of the new-product development department. Mr.

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Whether the Burro is used to speed track laying or relocation, for bridge building, earth or ballast handling or on locomotive coaling jobs, it will handle every job more efficiently and economically—because Burro Cranes are built for railroad work.

Only* BURRO *cranes have:

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- *Draw Bar Pull of 7500 lbs. (often eliminates need for work train or locomotive).*
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Shafer joined the Armco organization in 1925 as a civil engineer with the Armco Culvert Manufacturers Association. He became sales engineer of the culvert and pipe department in 1933, and later chief sales engineer of the pipe and formed products division. With the organization of Armco Drainage in 1945, Mr. Shafer was appointed manager of the sales engineering department.

John E. Jass, supervisor of tractor attachment design for the **Caterpillar Tractor Company,** Peoria, Ill., has been appointed assistant chief engineer. Other changes in the engineering department include: **Thomas M. Logan,** formerly in the research and engineering departments, promoted to service development manager; **Richard S. Frank,** supervisor of engine design, appointed to assume general supervision of the five supervising engineers in the engine-design division; **C. L. Kepner,** engineering designer, appointed to succeed Mr. Jass; **Randall Roman,** supervisor of general tractor design, made supervisor of specifications for comparative analysis in design; **Paul B. Benner,** supervising engineer on bulldozer design, appointed supervising engineer of all tractor chassis; **William G. Johnson,** supervisor of applied mechanics, appointed also to administer engineering supervision of basic engine design, formerly the responsibility of Mr. Frank, and **M. B. Morgan,** designer, made supervisor of all cooling equipment.

James A. Friend, vice-president and general purchasing agent of the **Nordberg Manufacturing Company,** Milwaukee, Wis., has been appointed senior vice-president, succeeding **F. Howard Kilberry,** who has resigned to become a management consultant of the National Supply Company, Springfield, Ill. Mr. Friend is succeeded by **Floyd T. Finley. Arthur W. Mueller** has been appointed assistant controller of the company.

James A. Friend

Trade Publications

(To obtain copies of any of the publications mentioned in this column, use postcards, page 611)

Armco Culvert End Sections—Armco Drainage & Metal Products, Inc., has published a 4-page bulletin entitled "Put and End to Troublesome Drainage Problems", which discusses the use of Armco culvert end sections to increase culvert efficiency, and reduce costs of culvert installation and maintenance.

Blackmer Rotary Pumps—The Blackmer Pump Company has published a six-page bulletin, designated as No. 307, on the design, construction, maintenance, operation and application of Blackmer rotary pumps. The bulletin also gives details concerning the sliding-vane and swinging-vane features of the pumps and presents selection tables and other data of interest to pump users.

Sand Drying Equipment — The Joy Manufacturing Company has published a bulletin, numbered F-26, on its improved rotary sand dryer. Included is detailed information concerning all standard and optional controls available with the unit.

Better Concrete Construction—The Sika Chemical Corporation, Passaic, N. J., has published a 12-page illustrated booklet, written specifically for architects and

(Continued on page 678)

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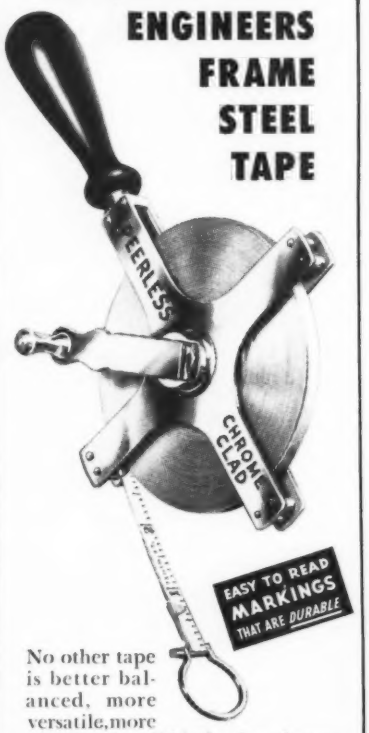

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Trade Publications (Cont'd)

engineers. Entitled "15 Steps to Better Concrete Construction" it lists information and specifications on Sika compounds designed to meet specific problems of concrete and masonry construction. It describes the use of Plastiment Retarding Densifier, which is said to render structures resistant to water, cracking and absorption, and to keep water content, concrete quality and setting time uniform regardless of atmospheric temperature. It also discusses 14 additional materials designed for coating, sealing, hardening, and for repair work on concrete and masonry. The booklet is complete with product descriptions and composition, specific uses, contributing properties, and architect's specifications.

Armco Drainage Structures — Armco Drainage & Metal Products, Inc., has published an illustrated folder discussing, with photographs and diagrams, the continuous beam strength, the strength to support loads and resist impact, and the joint strength of Armco metal drainage structures. The bulletin also lists the different types of structures available for various installations and kinds of service.

Oliver Industrial Wheel Tractors— The Oliver Corporation has published a new booklet on industrial wheel tractors. Covering the complete Oliver line, the booklet includes specifications, cross sections, detailed data on engines and transmissions and many application photographs. One section of the booklet is devoted to the various attachments which are available for the tractors, including bucket-loaders, maintainers, plows, mowers, backhoes, brooms, scrapers and trenchers.

Disston Chain Saws—Henry Disston & Sons, Inc., Philadelphia, Pa., have published a 36-page booklet, containing nearly 150 illustrations and entitled How to Cut Costs and Make Money with Chain Saws. The book describes the entire Disston line of chain saws and discusses and illustrates many maintenance problems, specific uses, specifications and capabilities of chain saws, telling how the saws may be used effectively on farms, in logging camps and in industry.

Architectural Aluminum — The Reynolds Metals Company has issued a 53-page portfolio on aluminum extruded shapes, embossed sheet, perforated sheet, plain sheet and plate, tubing and pipe, and other aluminum products for architectural use. The portfolio is in the form of indexed sheets contained in a special pocket-type folder. Full size cross sections are shown on these sheets, permitting draftsmen to trace the sections directly onto their own detail drawings. The portfolio is available without charge to architects, designers, engineers and other company officials who request it on their company letterhead.

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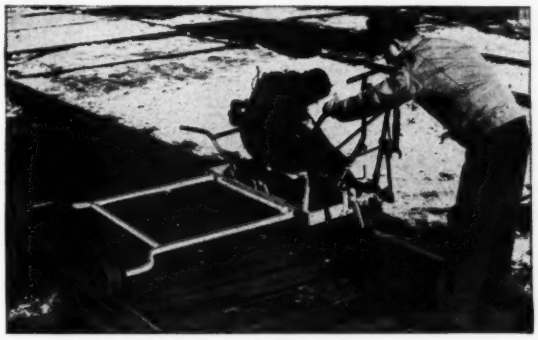

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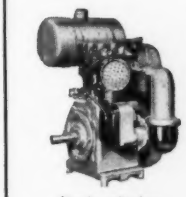

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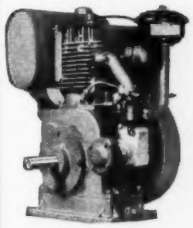
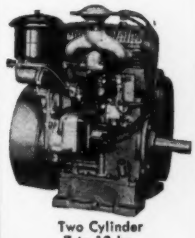
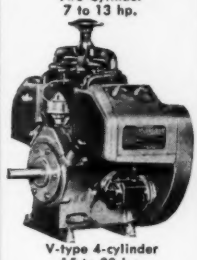
3 to 6 hp.



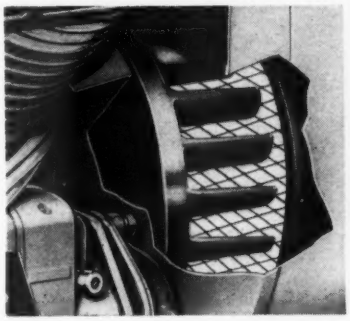
Single Cylinder
6 to 9 hp.



Two Cylinder
7 to 13 hp.



V-type 4-cylinder
15 to 30 hp.



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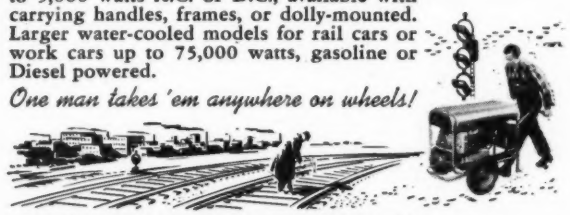

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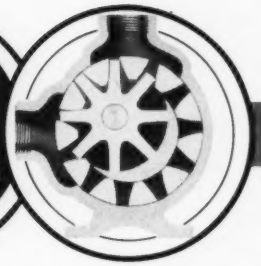

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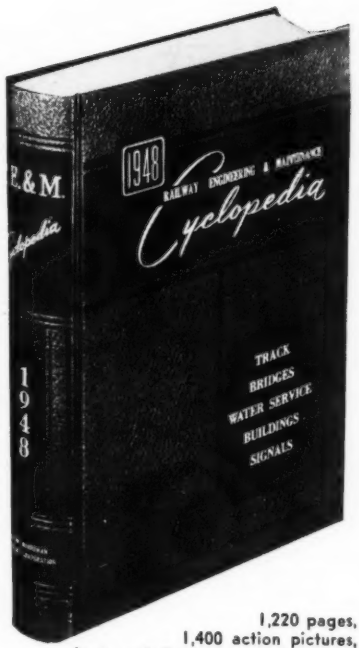

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ALPHABETICAL INDEX TO ADVERTISERS, JULY, 1950

A

Air Reduction Sales Company 607
Allis-Chalmers Tractor Division 631
Aluminum Company of America 615
American Hoist and Derrick Company .. 628
Armco Drainage & Metal Products, Inc. 608

B

Benbow Fence Tightener Co. 677
Bethlehem Steel Company 595

C

Canisteo Industries, Inc. 668
Caterpillar Tractor Co. 609
Chicago Pneumatic Tool Company 598
Chipman Chemical Company, Inc. 674
Cullen-Friestedt Co. 676

D

Dearborn Chemical Company 667
Dow Chemical Company, The 625
Duff-Norton Manufacturing Co., The .. 671

E

Eaton Manufacturing Company 594
Electric Tamper & Equipment Co. 605

F

Fabreeka Products Company, Inc. 618
Fairbanks, Morse & Co. 665
Fairmont Railway Motors, Inc. 632

G

Golden-Anderson Valve Specialty Company 596

H

Hubbard & Company 620

I

Industrial Brownhoist Corporation 603
International Harvester Company 617

J

Jordan Company, O. F. 680

L

Layne & Bowler, Inc. 681
Lewis Bolt & Nut Co. 680
Littleford Bros., Inc. 678
Lufkin Rule Co., The 678

M

Magor Car Corporation 621
Matisa Equipment Corporation, The ... 614
Michigan Power Shovel Company 673

N

National Aluminate Corporation 599
National Lock Washer Company, The .. 683
Nordberg Mfg. Co. 624
Northwest Engineering Co. 597

O

Ohio Crankshaft Company 681
Onan & Sons Inc., D. W. 680
Oxweld Railroad Service Company, The 604

P

P. & M. Co., The 593
Pacific Coast Borax Co. 672
Pittsburgh Plate Glass Company 623
Power Ballaster Division 600-601
Pullman-Standard Car Manufacturing Company 600-601

Q

Q and C Co., The 681

R

Racine Tool and Machine Company 627
Rails Company, The 610
Railway Track-work Co. 679
Rinshed-Mason Company 619

S

Schramm Inc. 663
Simmons-Boardman Publishing Corporation 626-682
Southwestern Petroleum Company 602
Speno Railroad Ballast Cleaning Co., Frank 675

T

Taylor-Colquitt Co. 606
Templeton, Kenly and Company 669
Texas Company, The 684
Thew Shovel Co., The 622
Timken Roller Bearing Company, The .. 634
True Temper Corporation 613

U

Union Carbide and Carbon Corporation 604
Union Metal Manufacturing Co. 629
Unit Rail Anchor Company, Inc. 620

V

Viking Pump Company 681

W

Wisconsin Motor Corporation 679
Woodings Verona Tool Works 661
Woolery Machine Company 616

Z

Zone Company, The 602

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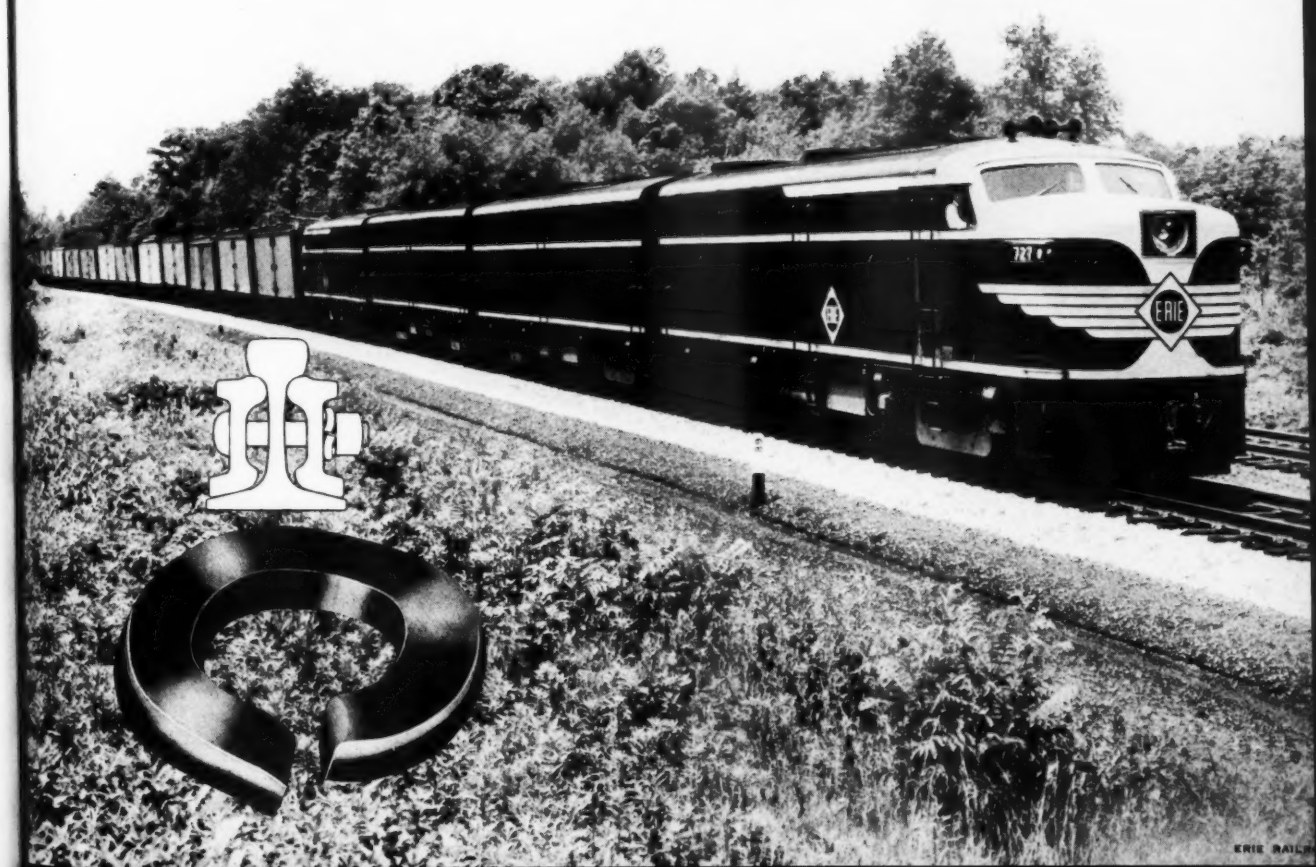

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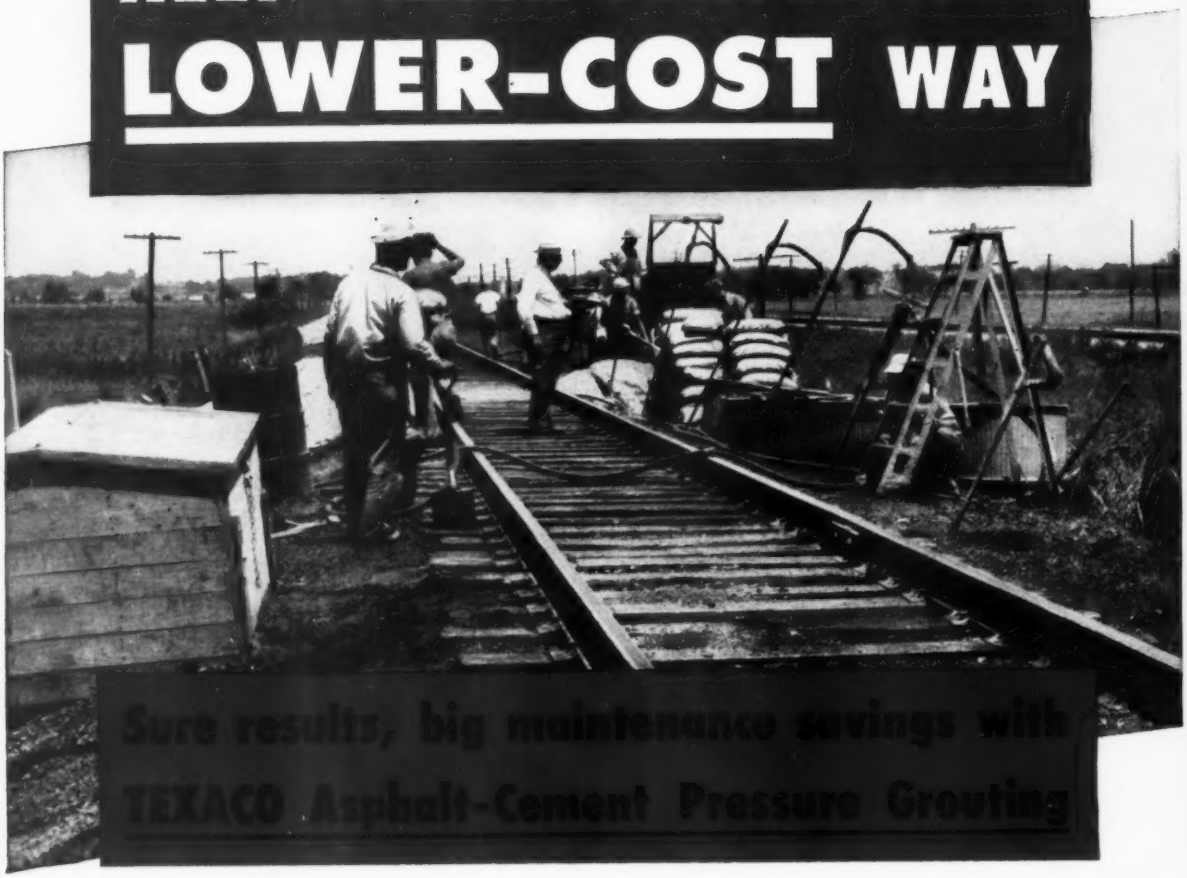

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